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## NATIONAL POLICY AND ISSUES

### SCISSORS MOVEMENT OF AGRICULTURAL, INDUSTRIAL PRICES DISCUSSED

Beijing JINGJI YANJIU [ECONOMIC RESEARCH] in Chinese No 4, 80 pp 73-76, 23

[Article by Jiang Xingwei [1203 5281 3262] of the Liaoning Academy of Finance and Economics, Dalian: "On Scissors Movement of Prices of Industrial and Agricultural Products"]

[Text] A correct solution to the problem of scissors movement of prices of industrial and agricultural products is bound to contribute substantively to the development of agricultural production, betterment of the livelihood of the peasants, reduction of the differences between industry and agriculture on the one hand and urban and rural communities on the other, solidarity of the alliance of workers and peasants and the four modernizations, especially the modernization of agriculture. The following are my views on a number of questions relating to the scissors movement of prices of industrial and agricultural products.

1. As a matter of history, the scissors movement of prices of industrial and agricultural products was originally an explanation of the fact that since industry always develops faster than agriculture in a capitalist society, the industrial capitalists are likely to avail themselves of their superior economic position to raise the prices of industrial products and to lower the prices of agricultural products in order to exploit the peasants. This kind of exploitation, which intensifies as industry develops, manifests itself in the ever-increasing disparity in the prices of industrial and agricultural products. If the prices of industrial and agricultural products were converted into price indices of a given period and projected in two curves on a statistical chart, the difference, small at first, would gradually expand in the shape of a pair of opening scissors. This is known as a scissors movement of price differentials, a manifestation of the exploitation of the peasant masses by the capitalists in a capitalist society.

A scissors movement of price differentials represents an exchange of unequal values between industrial and agricultural products. This means that in exchanging agricultural products for industrial products, the price of agricultural products is lower than their value, while the price of industrial products is higher than their value. The peasants are the losers in both buying and selling. Stalin, who regarded the scissors movement of price differentials as a problem of the exchange of unequal values between industrial and agricultural products, believed that the difference means to receive less money from the sale of agricultural products but pay more to buy industrial products. He said: "If we regard 'scissors movement of price differentials' as price differences in terms of production cost between



agricultural and industrial products, then the 'scissors movement of price differentials' would be something like this: No doubt, the sale price of our industrial products is higher than what it would otherwise be because our young industry needs protection against foreign competition and favorable conditions for speedy development...otherwise, we cannot provide our peasant economy with sufficient cloth and farm machinery. The price differentials between industrial and agricultural products brought about by these factors are responsible for the losses sustained by the peasant economy."<sup>1</sup> Stalin viewed the price differentials between industrial and agricultural products in terms of cost which, to a very great extent, reflects value. Consequently, the scissors movement of price differentials expounded by Stalin implies an exchange of unequal values.

Since the scissors movement of price differentials of the industrial and agricultural products represents an exchange of unequal values of these products, the size of the scissors movement depends on the extent of the inequality of values exchanged. The greater the inequality of the values exchanged, the greater would be the scissors movement. A reduction in the inequality of values exchanged (closer and closer to an exchange of equal values) will cut back the scissors movement differentials accordingly.

We know an exchange of equal values between industrial and agricultural products means that the ratio of their prices agrees with the ratio of their values. On the other hand, an exchange of unequal values between industrial and agricultural products means the ratio of their prices deviates from the ratio of their values. Consequently, the extent of the scissors movement of price differentials depends on changes in both the price ratio and value ratio between industrial and agricultural products. An accurate prediction of the scissors movement differentials must be considered in the light of changes in both price and value ratios.

Some comrades base their predictions of scissors movement differentials solely on the prices of industrial and agricultural products. They think a scissors movement of price differentials represents a relative rise of the price of industrial products and a relative fall of the price of agricultural products. The scissors movement differentials is simply a short form of "scissors shaped price differentials."<sup>2</sup> They have left out the substance of scissors movement differentials by relying on the prices of industrial and agricultural products to the exclusion of their values.

Before we proceed any further, I should like to comment on the problem of graphic illustrations of the scissors movement of prices of industrial and agricultural products. There used to be two methods of graphic illustrations. The one shows two curves on a statistical chart to represent respectively the sales price index of industrial products and the procurement price index of agricultural products. The other method also shows two curves on a statistical chart. One of these curves represents the price ratio index of industrial products traded for agricultural products (a price ratio index obtained by using the price index of agricultural products to divide the price index of industrial products). The other curve represents the price ratio index of agricultural products traded for industrial products (a price ratio index obtained by using the price index of industrial products to divide the price index of agricultural products). Here I should like to offer two comments: (1) The focal point of both methods is the price but not the value of industrial and agricultural products and therefore cannot accurately reflect the scissors movement differentials. (2) The second method of graphic illustration is defective because the price ratio index of industrial products traded for

agricultural products and the price ratio index of agricultural products traded for industrial products, like the positive and inversed norms of labor productivity, are actually the same. Either one of the two curves is sufficient to indicate changes in the price ratios between industrial and agricultural products. There is no need to have both curves. Moreover, it is meaningless to represent these two reciprocal indices by two curves and claim that they look like scissors. Suppose we have two curves one above the other. One curve represents the productivity of industrial labor over the years while the other represents its reciprocal. They look like scissors, don't they? But do they mean anything?

II. We know the scissors movement of prices of industrial and agricultural products is a product of the old society. Before the liberation, the amount of industrial products a given amount of agricultural products might trade for had been slipping steadily. Assuming that the composite price ratio between industrial and agricultural products was 100 before the war against Japan broke out in 1936, that ratio was up by 165.1 percent in 1948. Since the founding of the People's Republic, the party and state have made several readjustments of the irrational price structure of some industrial and agricultural products. Comparing 1978 with 1950, the procurement price of agricultural products was up by 107.3 percent, while the retail price of industrial products sold in villages was up only by 9.8 percent. The price differentials between industrial and agricultural products have been trimmed down by 49 percent. The same amount of agricultural products now trade for 90 percent more or even over 100 percent more industrial products as compared with that traded in 1950. This is especially true in distant border areas. The peasants have no doubt gained a lot in terms of commodity prices. If we take into account both price and value ratios between industrial and agricultural products, they still stand for an exchange of unequal values. The scissors movement of price differentials is as serious as ever. Some people believe if the composite price ratio between industrial and agricultural products had been restored in 1958 to the level of 1930-1936, the years immediately preceding the war against Japan, the scissors movement of price differentials would no longer exist. This observation is not accurate because these people are concerned only with changes in the price ratio differentials but not changes in the value ratio differentials between industrial and agricultural products.

Even though we are unable at present to use any scientific method to calculate value and therefore cannot figure out exactly the extent of the scissors movement differentials, we are sure they still exist and have become even worse in the past few years.

First, let us take a look at labor productivity. Comparing 1978 with 1957, industrial labor productivity has increased about 75 percent. That is to say, the per unit value of industrial products has dropped considerably. In agriculture, the labor productivity of the commune production brigades increased 47 percent as compared with 1957. But grain production increased only 45 percent and cotton production was up 25 percent, while oil production dropped 10 percent. This means that as agricultural labor productivity declined, the per unit value of agricultural products has gone up. These changes in the value ratio between industrial and agricultural products triggered by the declining value of industrial products and rising value of agricultural products are the principal reasons for unequal values exchanged between industrial and agricultural products.



Second, as far as production cost is concerned, many commune production brigades have sustained losses all these years due to rising cost of agricultural production brought about by the high cost of chemical fertilizers, pesticides, farm machinery and machine maintenance. According to investigations, in 1976 the production cost of 6 major grains produced by 1,296 production brigades of the whole country was 11.6 yuan per 100 jin, including agricultural levy. The procurement price of these grains was only 10.74 yuan per 100 jin. So there was a loss of 7.4 percent. The production cost of cotton produced by 302 production brigades in 1977 was 109 yuan per 100 jin, including agricultural levy. The procurement price of cotton at that time was 106.9 yuan per 100 jin, a 2 percent loss. These are the testimonials of the exchange of unequal values. The fact that the price of agricultural products was lower not only than their value but also their price demonstrates the seriousness of the inequality in the exchange of values.

Third, although many production brigades have increased their production, they have not realized any increase in income and some have even sustained reductions in income. According to the findings of surveys conducted by the provinces on 2,162 production brigades, the per mu yield of 6 principal grains increased from 232 jin in 1965 to 316 jin in 1976, a 36 percent increase. But the production cost per mu has jumped from 26.2 yuan to 40.5 yuan, an increase of 54 percent. The per day labor value has dropped from 0.7 yuan to 0.56 yuan.<sup>3</sup> This explains that the price of agricultural products has fallen so much below cost that the compensation accorded to agricultural labor is forced down to the lowest level. The labor value of some production brigades has dropped down to 20-30 cents per day labor.

Fourth, in 1977 the annual net output value created by an industrial worker was 2,800 yuan at current price as compared 324 yuan created by an agricultural worker. This means the value created by an industrial worker per year equals that created by 8.5 peasants. As for state revenue, 290 million peasants contribute 3-4 percent of the state revenue, while more than 90 percent of it comes from 80 million industrial staff and workers. What accounts for such a difference in the contributions to the state treasury by industrial workers on the one hand and agricultural workers on the other? Obviously the price of industrial products is higher than their value, while the price of agricultural products is lower than their value. So a part of the value created by agriculture is transferred to industry.

Fifth, a basically identical labor force earns more in industry than in agriculture. Take a production brigade for example. The gross daily earning of a worker is 1 yuan in growing grains, 2 yuan in raising pigs and over 5 yuan in industrial work.<sup>4</sup> There is another production brigade which earns 70 percent of its total income by committing 11 percent of its labor force to industrial production of cement and saws, while the remaining 30 percent is earned by 89 percent of its labor force engaged in agricultural production. This no doubt is due to the exchange of unequal values between industrial and agricultural products.

Sixth, some people have figured out that the price of industrial products in 1975 was about 15-20 percent higher than their value, and the price of agricultural products was 25-30 percent lower than their value. Can we say that the scissors movement of price differentials is no longer in existence?

Seventh, now let us compare the exchange ratio between certain industrial and agricultural products in our country with the ratio in the international market. In 1978 1 jin of grain could exchange for 2 jin of chemical fertilizers in the international market, but only 1 jin in our country. One jin of cotton could exchange for 6-8 feet of plain white cloth in the international market, but only less than 4 feet in our country. One jin of wheat could exchange for 1.5 jin of kerosene in the international market but only 0.4 jin in our country. This shows that the current price of our agricultural products is too low and that of our industrial products too high.

The above analysis demonstrates the exchange of unequal values between industrial and agricultural products, the scissors movement of their price differentials. Such marked scissors movement of price differentials hurts seriously the enthusiasm of the peasants in developing production, slows down the pace of agricultural development, affects the solidarity of the workers and peasants alliance and aggravates the difference between urban and rural communities as well as that between industry and agriculture. We cannot afford to let this continue. The scissors movement of price differentials should be reduced step by step in keeping with the development of industrial and agricultural production.

III. The scissors movement of price differentials will remain during the progress of the four modernizations. The peasants, for a long time to come, will have to contribute the state capital accumulation through prices and taxation. Their contribution through prices, however, should be gradually cut back in order to reduce the scissors movement of price differentials. Judging by the general trend as of now, the procurement price of agricultural products should be raised gradually and the price of farm-supporting industrial products should be cut back a bit by lowering the production cost. The sale price of general industrial products should remain stable or a bit lower. Instead of wiping out this phenomenon of paying more or less, there are a number of reasons why a reduction of the scissors movement of price differentials should be tied to simultaneous increase of both industrial and agricultural production. First, it involves our financial resources. A drop of 1 percent in the sale price of industrial products means a loss of 400 million yuan in revenue to the state. By the same token, an increase of 1 percent in the procurement price of agricultural products means an additional expenditure of 300 million yuan to be borne by the state. Second, in addition to agricultural levy which provides a part of the revenue, the peasants have to contribute to the state capital accumulation by accepting a lower price for agricultural products than their value. This is necessary for accumulating construction capital to achieve the four modernizations. Stalin said: "In view of the conditions, our peasants will have to face the realities. In addition to paying the general taxes, both direct and indirect, the peasants first of all have to pay higher prices for the industrial products, and secondly, to sell the agricultural products for less money. This is an extra levy imposed on the peasants for the sake of industry which serves the whole country (peasants included)." "To eliminate this extra levy and wipe out the 'scissors movement differentials' between urban and rural communities, we have to impose this temporary levy."<sup>5</sup> Third, any rise in the price of agricultural products must be compatible with the commodities which the state is able to supply to the villages. Once the procurement price of agricultural products is raised, the peasants who have more money at their disposal are likely to buy more at the market. However, due to the dislocation of the ratios between agriculture, light and heavy industry, our backward agricultural production and the pace of the growth of our light industry

have not been able to meet the requirements arising from the development of our country. Even if the state were financially fit to raise the procurement prices of agricultural products and by-products, it would find itself restrained by the lack of sufficient commodities for the market. Thus, when we increase the procurement prices of agricultural products, we must consider how to balance people's purchasing power and the supply of commodities. Fourth, when we raise the procurement prices of agricultural products, we must also consider their impact on general price stability. Any rise in the procurement prices of agricultural products is bound to affect the sale prices of agricultural products and the price of those light industrial products manufactured from agricultural raw materials. In the end the whole commodity price structure will suffer. Consequently, any reduction of the scissors movement of price differentials between industrial and agricultural products should be gradual enough as to keep pace with the development of industrial and agricultural production. No attempt should be made to achieve it instantly in one stroke.

Some people believe the only way to reduce the scissors movement of price differentials is to raise the procurement of agricultural products and lower the sale price of industrial products. I do not think the idea is well conceived. The most realistic approach to the problem of reducing the scissors movement of price differentials between industrial and agricultural products is to raise the real income of peasants and reduce the gap between the living standard of industrial workers and peasants. To bring the peasants' standard of living closer to that of the workers will help to mobilize the enthusiasm of the peasants in production. Thus, the most effective measures to reduce the scissors movement of price differentials are to realize agricultural modernization, increase the productivity of agricultural labor, develop a diversified economy, commit surplus agricultural labor to new productive operations and carry out various farm policies to mobilize the enthusiasm of peasants. The next step would be to adjust the price ratio between industrial and agricultural products within the limits of the state's financial resources. There should also be programs aimed at reducing the price of industrial products, especially those needed by peasants, but accompanied by increase in the procurement price of agricultural products. As a matter of rational pricing, the main emphasis should be on raising the procurement price of agricultural products. However, as attested by years of experience, any rise in the price of agricultural products will involve a wide spectrum of problems and cause a series of chain reactions affecting state finance, wages, cost of industrial production, business operations and the livelihood of the people. A policy based on gradual reduction of the price of industrial products seems more productive. First of all, it will encourage the peasants to seek better income by producing more, increase the capability of agriculture to expand reproduction and enhance the development of agricultural production. Secondly, it encourages industry to improve its management, practice careful budgeting, lower the production cost and improve the quality of products. If the scissors movement of price differentials between industrial and agricultural products were too extensive, agricultural production would suffer. Due to disruption by the "gang of four," the amount of agricultural products traded for industrial products in the past few years showed very little increase. There was an annual average increase of 2.5 percent between 1952 and 1973 but it slipped to 0.3 percent between 1974 and 1976. Confronted by the situation, our government, acting to further reduce the scissors movement of price differentials between industrial and agricultural products, to encourage the peasants to increase their income through the development of agricultural production and to mobilize their enthusiasm, has decided to raise the procurement prices of several principal farm products, such as grain, cotton, edible



oil and hogs. This resulted in a 24.8 percent increase in the procurement prices of 18 major agricultural products. The total increase amounts to more than 7 billion yuan. The peasants receive an additional income of 8 yuan per capita. This is a very important policy decision by the Party Central Committee to speed up the development of agricultural production, an indication of its concern for the broad peasant masses. The adjustment will no doubt correct the low price of agricultural products and reduce the scissors movement of price differentials. It will increase the income of peasants, improve their livelihood, maintain a more rational price ratio between various agricultural products, facilitate planned development of agricultural production according to established ratios and further reduce the difference between industry and agriculture as well as that between urban and rural communities. From a long-range viewpoint, however, the emphasis should be placed on increasing the productivity of agricultural labor and lowering the cost of agricultural production so as to help the peasants realize a gradual increase of real income. Once the livelihood of the peasants improves, their enthusiasm for developing production may then be mobilized to speed up agricultural production to meet the needs of the four modernizations.

#### FOOTNOTES

- <sup>1</sup> Stalin: "Conversation With Foreign Workers Delegation," "Complete Works of Stalin," Vol 10, p 195.
- <sup>2</sup> Xu He [1776 4421] et al: "Explanations of Political Economy Terms," People's Press 1974 Ed. p 161.
- <sup>3</sup> Yang Wen [2799 2429]: "Strengthen Scientific Research in Agricultural Economy," GUANGNING RIBAO, 7 Dec 78.
- <sup>4</sup> Huang Tingjun [7806 1694 7486] et al: "Smash Fake Leftism and Genuine Rightism To Achieve High Speed Agriculture," RENMIN RIBAO, 14 Nov 78.
- <sup>5</sup> Stalin: "The Plenum of the Soviet Communist (Bolshevik) Party Central Committee: The Problem of Industrialization and Grain," "Complete Works of Stalin," Vol 11, pp 139-140.

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## NATIONAL POLICY AND ISSUES

### PROMOTION OF TOURISM URGED AS AID TO ECONOMY

Beijing JINGJI YANJIU (ECONOMIC RESEARCH) in Chinese No 4, 80 pp 77-80

[Article by Liu Shijie [0491 0013 2638] and Wang Ligong [3769 4539 4854] of the Jiling College of Finance and Commerce: "Tourism in the National Economy"]

[Text] Tourism is an important sector of the economy. Capitalizing on tourist attractions and facilities, it is an enterprise to provide services to tourists. At present, tourism has become not only an important sector but also a decisive factor in the national economy of many countries. Unlike agriculture, industry and commerce, tourism does not produce either farm products or manufactured goods. Nor does it handle the circulation of commodities. Its impact on the national economy comes from the services it renders to tourists.

In his "Report on the Work of the Government" to the Second Session of Fifth National People's Congress, Comrade Hua Guofeng pointed out correctly a policy of "active development of tourism." A well-run tourist trade for our country may very well increase our foreign exchange reserve, satisfy the livelihood requirements of the people, expand employment opportunities, speed up the development of most sectors of our national economy and contribute to the realization of the four modernizations.

#### 1. To Earn Foreign Exchange and Balance International Payments

To earn foreign exchange is an extremely important task in developing the national economy. The amount of foreign exchange a country earns represents its ability to meet international payments and the strength of its economy. Apart from foreign trade, many countries regard tourism as an important vehicle to earn foreign exchange. Statistically speaking, people the world over spend about U.S.\$60 billion for tourism purposes. The ratio by which this huge amount of money goes to various countries depends on the development of tourism in each country. Income from tourism has become a vital source of foreign exchange to those countries with well developed tourist trade. In 1978 Spain received 40 million foreign tourists, 10 percent more than its entire population, and earned U.S.\$6.7 billion, over one-third of its national revenue. Spain, with a population less than 1 percent of the world population, earns over 11 percent of the foreign exchange spent by tourists the world over. This represents Spain's ability to develop tourism to earn foreign exchange. Switzerland, which usually has a trade deficit of about 6 billion Swiss francs, was able to earn in 1976 over 5 billion Swiss francs, which practically helped balance its international payments. So Switzerland regards industry, banking and tourism as the three pillars of its economy. Compared with the developed

countries, our country has tremendous potentials for promoting tourism. We are an expansive populous country with abundant resources. With a long history known to the world, our country abounds with scenic and historical sites which are excellent tourist attractions. Although tourism, still in its infancy in our country, is not yet able to earn much foreign exchange, I am sure it will develop rapidly, as we have so many attractions to offer.

In developing our national economy, we have to import advanced technology from foreign countries to help us achieve the four modernizations. So we need vast sums of foreign exchange to meet our international payments. And, we need more than foreign trade to earn the foreign exchange we require. Tourism is one of the vehicles. If we were able to carry out the first project in our state plan, we would receive 3.5 million foreign tourists annually by 1985 and earn U.S.\$2.5 billion. If the second project in the state plan were carried out, we would receive 6 million foreign tourists annually by 1985 and earn U.S.\$5 billion. As tourism keeps expanding, if we commit 1 percent of our population to man the tourist trade, we may have 10 million foreign tourists who will bring in U.S.\$10 billion at \$1000.00 per capita as service charge. That equals our current foreign trade earnings. Judged by the development of tourism the world over, it is entirely possible. If our tourist earnings reached such a proportion, it would contribute substantially to the development of our national economy and the four modernizations.

As a matter of fact, tourism is more profitable than foreign trade in earning foreign exchange. When we spend 1.7 yuan RMB to provide tourist service and earn U.S.\$1 in return, we break about even at the current exchange rate. On the other hand, to earn U.S.\$1 through foreign trade, we have to export commodities worth two times more than the value of the dollar at the current exchange rate.

A foreign tourist who stays 12-14 days in our country has to spend about \$1000.00. To earn that much foreign exchange through trade, we have to export 10 tons of crude oil, 12 bicycles, 1.5 tons of powdered milk and 40 tons of apples. If we earned U.S.\$5 billion through tourism according to the second project in the state plan, we would be able to save for our domestic market 50 million tons of crude oil, 60 million bicycles, 7.5 million tons of powdered milk and 200 million tons of apples. That would help improve the people's livelihood.

## 2. To Satisfy the Needs of the People and Expand the Withdrawal of Currency From Circulation and the Accumulation of Capital

The development of tourism covers both international and domestic tourist trade. Domestic tourism not only satisfies the need of domestic tourists but also absorbs idle money in the hands of our people, an important vehicle to withdraw currency from circulation and accumulate capital for construction.

The expansion of tourism in recent years has led to the emergence of organized domestic tours in various countries. According to statistics, over 1 billion people the world over took advantage of holidays in 1978 to tour their own countries. They are 4 times the number of international tourists and represent U.S.\$240 billion of tourist income. In some countries where tourism flourishes, income from domestic tourism often exceeds that from international tourism. Take the United States for example. In 1976 the United States earned \$6.7 billion from foreign tourists but \$98 billion from domestic tourists. The latter is 14.2 times

the former. The earnings derived from domestic tourism is nearly 6 percent of its gross national product. Romania is another good example. In recent years, Romania has received 3.65 million foreign tourists and 6.35 million domestic tourists, the latter nearly doubled the former. It has earned U.S.\$400 million from the foreign tourists and 1.3 times more, or U.S.\$500 million, from the domestic tourists. Domestic tourism in both the United States and Romania has been instrumental in withdrawing currency from circulation and in capital accumulation. Although our domestic tourism is in its infancy, it has tremendous potentials in the long run and will become more and more promising as the livelihood of the people improves. At present, we offer commodities and services to the masses to withdraw from circulation currency in the hands of our people. Once the income of our working masses increases along with the development of production, these vehicles for withdrawing currency from circulation will not suffice. We must provide tourist services for the masses so as to expand the withdrawal of currency from circulation and accumulation of capital. Now both Beijing and Shanghai have begun to organize long-distance, medium-distance and short-distance tours to satisfy the needs of the masses. There are tours originating from Beijing to the Ming Tombs, the Badaling, the Qing Tombs, etc. There are also tours originating from Shanghai to Suzhou, Hangzhou, Beijing and Beidaihe.

Domestic tourism is meant to satisfy the livelihood requirement of the people. Although the basic livelihood requirements are clothing, food, shelter and transportation, people will travel when their standard of living improves. The higher the standard of living, the greater would be the urge to travel. Take France for example. Between 1966 and 1976 the number of peasant tourists as compared with the peasant population went up by 5.6 percent, that of factory workers up by 10.9 percent, that of service personnel up by 7.6 percent and that of other working personnel up by 10.5 percent. The number of tourist high level managerial personnel and clerical staff did not register any increase although there was a slight increase in the number of tourism mid-level managerial personnel. The number of domestic tourists as compared with the total population went up during this 10-year period from 41.7 to 51.6 percent, an increase of 9.9 percent. The increase represents mainly a growing number of working people taking tours. We are a socialist country where the working people are masters. When the people's standard of living improves, there will be more working people taking tours. Our tourist trade as such will aim at enabling the working people who travel to become relaxed and fit to work for the four modernizations.

### 3. To Expand Employment Opportunities for a Vast Labor Force

Employment opportunities are crucial to the development of the national economy. Tourism as of today has scored an annual worldwide record of 265 million tourists and about 100 million engaged in the tourist trade. In some countries where tourism is well developed many people are engaged directly or indirectly in tourist services. This contributes decisively to employment. The following figures show the conditions in those countries where tourism flourishes:

Country	People in Tourist Trade	% Total Population
Yugoslavia	200,000	1%
Italy	1,000,000	2%
USA	7,000,000	3%
Great Britain	2,000,000	3.5%
Switzerland	2,500,000	40%



Switzerland ranks first in tourist trade, and most of its adults hold jobs related directly or indirectly to tourism. Economically speaking, tourism, one of three pillars of the Swiss economy, is an important employment provider.

Being a populous country with a vast labor force, the most crucial problem in the development of our national economy is to make proper use of the labor force. In his "Report on the Work of the Government" to the Second Session of the Fifth National People's Congress, Comrade Hua Guofeng said: "To expand employment opportunities to enable those waiting for jobs to get suitably employed we must actively develop handicraft industry, repair services, commerce, general services, breeding and cultivation of living things, food services, tourist trade, urban public utilities, afforestation and other required enterprises." The development of tourism in our country will no doubt provide employment opportunities not only for those engaged directly in the tourist enterprise but also for those in light industry, transportation, commerce and services which will expand along with the growth of tourism.

Since tourism is in its infancy in our country, the number of tourists we receive each year is rather small. Nor do we have many well developed tourist-oriented enterprises. Consequently, the people engaged both directly and indirectly in the tourist trade is also limited. This vacuum is our potential for developing tourism to create jobs for a vast labor force. Suppose we actually receive 3.5 million or 5 million tourists in 1985 and, like Thailand, we let every tourist have an average of one person involved in the tourist trade, we would have 3.5 million or 5 million tourist-oriented job openings. If our tourism develops as rapidly as Yugoslavia, Italy, the United States or Great Britain and 1 percent, 2 percent, 3 percent or 3.5 percent of the population were to go into tourist trade, 10 million, 18 million, 27 million or 31.5 million people would be employed directly and indirectly through tourism. By that time, tourism will indeed be a valuable reservoir of employment opportunities.

4. As a composite sector of the economy, tourism is closely related to other related sectors of the national economy.

Tourism depends on convenient means of communications. This is evident in the development of transport by air, railroads, waterways and super highways. Unless we have suitable means of communications, we would not be able to transport tourists into our country and visit places of tourist interests. So we need to develop communications and transportation, the main arteries of tourism, to insure a continuous flow of foreign tourists. Take Romania for example. The Romanian airline has developed rapidly to keep pace with its growing tourist trade. Though only a medium-size country, Romania has 10,000 kilometers of domestic airlines and 120,000 kilometers of international airlines serving its capital and 14 other major cities and connecting Bucharest to 37 countries in Asia, Africa and North America. Romanian airplanes now fly to more than 400 major airports of the world. Our airways, both domestic and international, are unfit for tourism and must be greatly expanded. The Beijing Airport has already been extended to accommodate growing tourism. With landing facilities for all kinds of jumbo passenger planes, its increased transport capacity has made Beijing much more accessible to tourists. Our railroads, waterways and highways also require extensive development to meet the need of the tourist trade. We are sure our communications and transportation facilities will develop rapidly along with the growth of tourism.



The development of tourism also requires convenient lodging and food service. This means comfortable hotels and restaurants without which tourism will not develop. The hotel business in Singapore has expanded in response to its growing tourism. In 1967 Singapore had only 16 hotels with about 1000 rooms to accommodate tourists. In 1976 when tourists began to come in greater numbers, the number of hotels multiplied to more than 70 with more than 10,000 rooms, a tenfold increase in hotel rooms within a decade. Our hotels and restaurants, unfit for expanding tourism, are due for sweeping improvement. We are now building hotels and restaurants at major tourist centers, such as Beijing, Guangzhou, Shanghai and Guilin.

The production and sale of merchandise to serve tourists must be duly developed to keep pace with the growing tourism, which cannot develop fully unless we have sufficient merchandise to attract tourists. The rapid growth of tourism in Hong Kong is due largely to its excellent supply of merchandise. The number of tourists has been growing steadily because they regard Hong Kong as a "shopping paradise." The growth of tourism in Hong Kong is accompanied by an increase in the ratio of money tourists spend on merchandise as compared with what they spend on touring. The ratio went up from 56.4 percent in 1966 to 59.3 percent in 1970 and 61.3 percent in 1977. The growth of tourism has brought prosperity to Hong Kong and enhanced domestic trade in Yugoslavia. Tourist consumption per annum in Yugoslavia accounts for 20,000 tons of grain, or 2 percent of its commercial grain, and 100,000 tons of meat, or a little over 10 percent of its annual meat production. The development of tourism in Yugoslavia has activated its domestic trade and increased its business income.

Our famous handicraft articles and local specialties are tourist attractions. The growth of tourism has already propelled the production and sale of these products. In the second half of 1978, the Shanghai Arts Crafts Company sold to tourists 2.3 million yuan RMB worth of handicraft products. The sale of merchandise to tourists by the Municipality of Shanghai as a whole amounted to a gross total of 20-22 million yuan RMB, 7-8 million yuan of which are business profit. The production and sale of tourist-related merchandise in Beijing, Guangzhou, Guilin and Hangzhou have also grown along with the development of tourism. We have no doubt that the production and sale of tourist-related merchandise will expand to usher in greater business prosperity incidental to the growth of tourism.

In a word, with such favorable conditions for developing tourism, if we adopt positive measures to carry out the state program to promote tourism, our tourist trade will grow by leaps and bounds and reach a position to contribute even more substantially to our socialist modernization.

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## FINANCE AND BANKING

### BRIEFS

**SICHUAN FINANCE MEETING**--The Sichuan Provincial People's Government recently held a forum of finance work and demanded that the whole province fulfill the year's plans. The meeting pointed out: the financial situation of Sichuan Province was good from January to September. Leaders at all levels must continue to work hard and grasp the following: 1) enliven the economy and increase production; 2) encourage all local departments to work hard to increase financial revenue; 3) abide by laws governing financial revenue and the economy and make sensible use of loans; 4) insure that all departments strive to cut expenses; and 5) strengthen their leadership over finance work by launching ideological education. [Chengdu Sichuan Provincial Service in Mandarin 2300 GMT 18 Oct 80]

**LIAONING TAX**--The Shenyang Municipal Tax Bureau had fulfilled 86.67 percent of its annual tax collection plan by the end of October, an increase of 3.87 percent over the corresponding 1979 period. [SK071032 Shenyang Liaoning Provincial Service in Mandarin 2200 GMT 6 Nov 80]

**QINGHAI FINANCIAL CIRCULAR**--The Qinghai Provincial finance department recently issued a circular urging various localities and departments concerned throughout the province to adopt effective measures to do a good job in collecting tax revenues during the remainder of 1980. The circular impels management departments of all enterprises to halt extravagance and waste so as to have their taxes paid on time. No tax revenue unit or department should arbitrarily adopt a decision on tax cuts or exemptions. The circular also warns that all tax-paying enterprises and establishments as well as units should pay their taxes in accordance with tax regulations. Regarding those who refuse to pay their taxes despite repeated warnings, it is necessary to deduct money from their bank deposits. It is also necessary to hold those responsible who evade a large amount of taxes, refuse to pay them and insult tax collectors. Appropriate punishment must be meted out to these persons. [SK110643 Xining Qinghai Provincial Service in Mandarin 2330 GMT 9 Nov 80]

**LIAONING MEETING ON REVENUES**--The Liaoning Provincial meeting of directors of financial and tax bureaus called for efforts to practice economy, collect revenues according to policies, economize, strengthen management and the supervision of revenues and expenditures, correctly enforce the profit-retaining system and vigorously and steadily carry out reforms in revenue and tax collection. [Shenyang Liaoning Provincial Service in Mandarin 2200 GMT 10 Nov 80]

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## ENERGY

### ADVANCES IN SOLAR ENERGY UTILIZATION DESCRIBED

Chongqing XIN NENGYUAN [NEW ENERGY SOURCES] in Chinese No 1, Feb 80 pp 1-16

[Article by XIN NENGYUAN staff members Gu Jian [7357 1017] and Li Mengming [2621 1322 6900]: "Development of Technology for Utilizing Solar Energy in This Country"]

[Text] Since 1975 solar energy technology in this country has developed rapidly, and more than half of the country's provinces and municipalities are already pursuing research on solar technology and experimental development of equipment to various degrees. Such technologies and equipment as solar water heaters and solar ovens have already come into some use and have gained certain achievements. These developments show that our country has already made great strides in research on the development of new energy sources, and like the development of methane production, experimentation and popularization of the use of solar energy are meeting the approach of the third energy transformation in human history.

From late August to the first third of September of last year, the Second National Experience-Exchange Conference on Utilization of Solar Energy was held in Xi'an, after which the inaugural meeting of the Solar Energy Society and the first Technical Conference were held. At the same time, our country held an exhibition on utilization of solar energy and invited American and West German colleagues to bring products and participate. These two conferences and one exhibition are an overall review of our country's solar use technology and also constitute a great stimulus to it, and we trust that following these events our country's solar technology will develop more rapidly and on a larger scale.

#### Solar Ovens

Particular attention at the conference was attracted by the exhibit of a variety of solar ovens developed by this country, technology for determining solar oven characteristics, and discussion of solar furnace design, materials and theory.

A parabolic shell inclined-axis reflector solar oven developed by the Solar Energy Research Laboratory and the peasant masses of the Gannan Zhuang Nationality Autonomous Prefecture, Gansu Province, was introduced at the Solar Energy Society Meeting. This solar furnace uses a parabolic collector with an area of 1.36 square meters; the reflector surface consists of 4.5 x 4.5 cm cemented reflective sections, reinforced by a wood frame. The parabolic reflector is

supported by a turnable mount which can be rotated through 360 degrees and can move the reflector vertically through 70 degrees. Above the reflector is a pot support whose position can be adjusted slightly to improve the focus. The external shell of the mirror is made of papier mache so as to make it easy to use local materials and to decrease fabrication cost. Experiments indicate that when direct solar radiation is 588-630 kilocalories per square meter, the solar oven has an average power of up to 340 watts. This type of solar oven has already been popularized in 280 households of 1 brigade, and has had a major effect in saving fire fuel and labor. The oven's cost is about 28 yuan.

Another solar oven basically similar to the Gannan oven is the HB-3 solar oven developed by Linxi County, Hebei Province. This oven was developed starting in 1974, and more than 3,600 units of 16 types have already been fabricated. The HB-3 has a 2.5 square meter collector surface with a focal length of 75 cm and according to experiments the maximum temperature at the focus is 680°C. The parabolic mirror is made of small 4 x 3 cm glass mirror sections, and the shell is made of cement magnesite. A T-shaped or H-shaped support is used. The shell is rather heavy and the center of gravity rather stable, but it is not easy to move. The unit is shown in Figure 1 [not reproduced].

The Kunming Normal Academy has developed an improved box-type solar oven in which the solar radiation can both enter the box directly or be focused on the bottom of the box by two side-mounted parabolic reflectors. This design considerably increases efficiency. A second feature is that it can be disassembled, which increases its portability. A third feature is that it has a variety of uses. In clear weather the temperature in the box can rapidly increase to 200° or more. Thus, it can be used to steam rice or boil water, and it also can be used as a hospital sterilizer. This solar oven is shown in Figure 2.

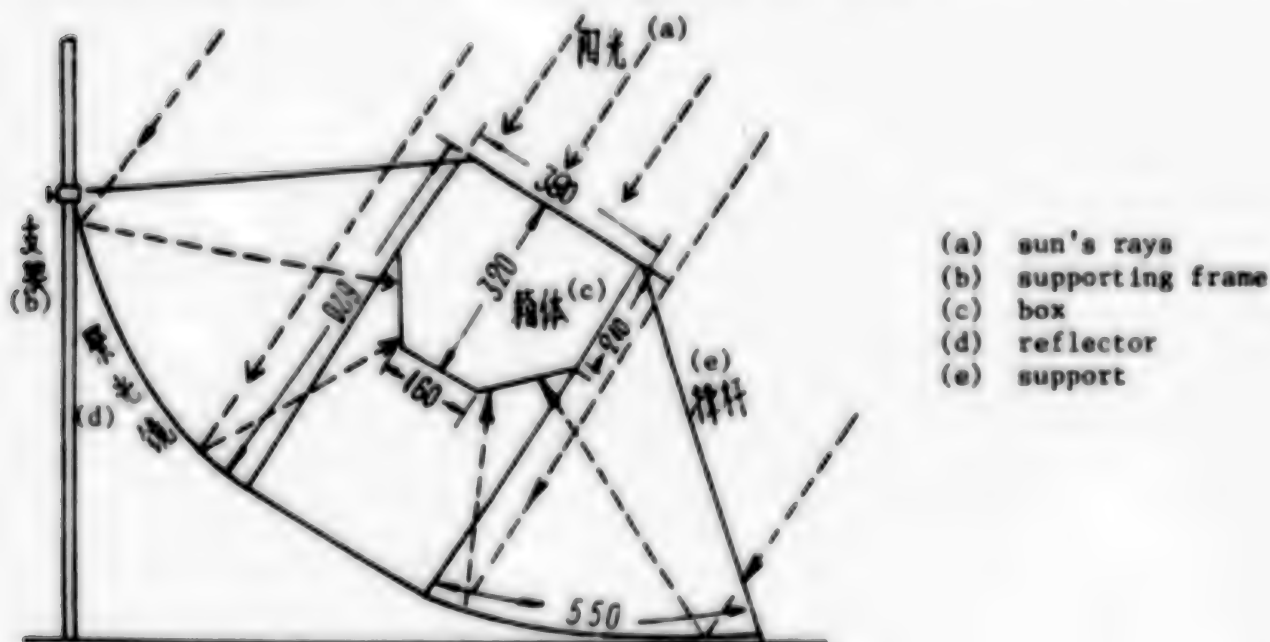


Figure 2. Kunming Normal Academy box type solar oven



The Zhengzhou Institute of Automation and the Zhengzhou No 3 Middle School have jointly developed a portable inclined-axis solar oven. This oven was described at the First Solar Energy Utilization Exchange Conference in 1975, and has since been used experimentally for 4 years with continuous summarization and improvement, leading to the development of the current portable inclined-axis oven (see Figure 3) [not reproduced]. When not in use it can be folded up 'like a suitcase. When the wooden case is opened and the solar pointer inside directed toward the sun, the more than 700 small reflecting strips cemented inside the box which form the solar reflector focus the sun's rays 800 mm away in the focal area. The collector area is about a square meter, and experiments indicate that the average power is about 387 watts, with a maximum temperature of 450° at the focus. This solar oven design has the shadow of the cooking vessel fall outside the reflector, so that cooking is easier.

The unique characteristics of our country's solar oven development are expressed in a series of requirements for the use of solar ovens, such as provision for protecting the person doing the cooking from high-temperature burns, the requirement of resistance to damage in rural use, the requirement that it be light and easily movable or portable, and the like, and much progress has been made. In particular, theoretical studies focusing on improvement of focusing efficiency and decreasing heat loss have been made. It is expected that the new generation of solar ovens will show further progress.

#### Solar Water Heaters

Solar water heaters are a kind of equipment which is already in rather extensive use in our country, and currently 365 units have built them; there is already more than 40,000 square meters of collector surface. Most of the solar water heaters currently in use are tube and plate types or corrugated sheet types. Such water heaters are already in factory series production.

Solar energy has many advantages, but it is limited by weather conditions and by the time of day, and accordingly operates intermittently. Since for many uses continuous provision of energy is desired, one way of solving the problem is through storage, but complementing them with other energy sources seems to be an effective and economical approach. For solar heating, the Fujian Province Institute of Metrology combined waste heat from boiler exhaust gas with a solar water heater, using the heat from the exhaust gases to supplement that from the solar heater. A photograph of this installation is on the back cover [not reproduced]. The solar water heater has an area of 60 square meters, the boiler is a hand-fired 6-ton unit which consumes 600 kg of coal a day, and according to initial results 100,000-120,000 kcal can be recovered from the exhaust gas. This installation is in experimental use at the Sanning Tool and Die Plant, and is providing hot water year round. Fujian Province has already built 10 different models of combined installations, of different sizes, which are now in operation.

Currently research is dealing both with improvement of existing tube and plate collector structure and capabilities, and also with developing models made from new materials, such as plastic and enameled units. In order to improve the efficiency of tube and plate type collectors, Tianjin University investigated the optimum tube spacing, reaching the conclusion that the tube spacing can be selected in terms of the collector plate efficiency  $\eta$  and the material consumption, as

well as tube diameter and plate thickness. The Research Institute of New Technology in Beijing and the China Scientific and Technical College have carried out design research on natural-cycle solar water heater systems which indicates that use of a collector with good performance characteristics is the key method of improving system thermal capabilities, and that the geometric layout of the system has an extremely great influence on thermal characteristics. This analysis was based on experimental work and used mathematical modeling to make a relatively comprehensive analysis of certain primary parameters in water heater systems design. This type of research is a great advance over the usual comparative experiments, and is a commendable approach. Figure 4 [not reproduced] shows the Beijing Institute of New Technology's inclined box solar collectors. The Shanghai Institute of Silicate Research and other units have created an enameled box type solar water heater whose design is shown in Figure 5. The collector plate has an area of 0.5 square meters, and the transparent area is 0.64 square meters, with a water capacity of 4.9 kg. The enamel used for the collector is made up according to the specific requirements and is about 0.12-0.15 mm thick. Preliminary experiments showed that the presence of the enamel layer did not have a very great effect on heat resistance, and accordingly the collector characteristics were comparable to those of the tube and plate type collector. But this type of collector is of simple design and easy to produce in an industrial process, so that it can be manufactured in large quantities. If sufficient attention is given to the connector parts, service life can be longer than that of tube type collectors. Currently the device is still in experimental development, and it has yet to undergo testing.

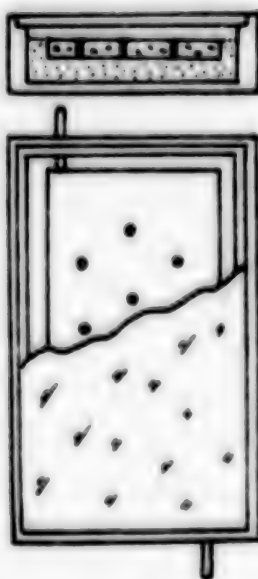


Figure 5. Enameled box type water heating collector

Anyang Prefecture, Henan Province, has created a glass tube type solar water heater. This type of collector has a structure basically similar to that of the tube and plate collector, but glass tubes are used in place of steel ones. Soft rubber connectors were used for the exit and entry pipes, and production

costs were slightly less than for the tube and plate models. According to preliminary experiments, performance is close to that of tube and plate type collectors.

### Solar Heat Collectors

Flat-plate type heat collectors can be used not only for water heaters, but also for space heating, air conditioning and other purposes. Accordingly, many organizations have carried on research on such aspects as improving flat plate type collector efficiency, improving water or space heating output temperature, tracking mechanisms for flat plate collectors and the like. For example, the Institute of Mechanics has submitted a design calculation method for the collector area of flat plate collectors and an experimental report on the characteristics of a flat tube type collector; the Qinghua University Research and Teaching Group on Air Conditioning has developed rational measures to improve flat plate type collectors efficiency; the Guangzhou Energy Research Institute has investigated the heat absorption process in glass tube type solar collectors, and so on. These investigations will unquestionably improve flat plate collector characteristics. In general, flat plate collectors require relatively low temperatures, and utilize diffuse radiation from the sun, so that they do not need tracking mechanisms. But this does not rule out the use of tracking equipment in certain situations so that the collector can receive maximum solar radiation. The problem is that the use of tracking mechanisms requires a greater investment and the consumption of a certain amount of energy. Accordingly, the problems of how big an increase in efficiency can be achieved, how much of an increase in collection capacity can be achieved, and whether it is economically justifiable, require theoretical investigation and practical comparisons. Qinghua University has produced a report on how much benefit can be achieved by using a tracking installation with a plate collector which indicates that if a relatively high temperature is required, by using a tracking mechanism with a 1 square meter collector an effect equivalent to 1.7 square meters of collector surface can be achieved and the time of operation extended. Accordingly, if the investment for a 1 square meter collector is larger than that for a tracking device designed for a 1 square meter collector, with current low glass transmission coefficients and without the use of selective coatings, use of a tracking mechanism of a collector will be cost effective.

A vacuum-type glass tube collector is a new device which increases the efficiency and the temperature of the working material. The Shenyang Municipal Institute of Construction Engineering and other units and the Qinghua University Department of Electronics have each quickly experimentally developed evacuated glass tube type collectors, which attracted much attention when shown at the exhibition.

The evacuated glass tube collector consists of an external sleeve, an absorber tube and an interior tube. Because the space between the exterior sleeve and the heat absorbing tube is evacuated, heat loss is decreased and the collector temperature raised, so that without using a tracking mechanism it can be used as a collector for solar heating and air conditioning.

The Shenyang Municipal Construction Engineering Institute has already used evacuated glass tubes in a solar collector with an installed area of 1330 x 1020 mm and a heat collecting surface of 1 square meter, using 12 evacuated glass tubes spaced 82 mm apart. The absorber tube dimensions are 40 x 1085 mm, the sleeve measures 50 x 1070 mm, and the wall thickness is 1.5 mm. The absorber tube and the sleeve are sealed at one end, while the other has a movable seal to provide room for expansion after absorption of heat. Below the collector is a flat reflector, and the shell is a polyvinyl chloride board. The absorber tube is painted with a selectively absorbing layer. In 10 days of testing, the evacuated tube collector collected a maximum of 2,938 kcal/m<sup>2</sup>, with a surface temperature of 80.1°C. The collection time was rather long. It can also be used in cloudy weather, and the collector temperature reaches a level close to that achieved by a flat plate collector in sunny weather, i.e. 40-60°C.

The evacuated glass tube developed by the Qinghua University Department of Electronics has an exhaust tube attached to one end of the sleeve, the external diameter of the heat absorber tube is 40 mm and the tubes are 600 and 1,200 mm long. Preliminary measurements indicate that the low-temperature efficiency is rather high, above 50 percent. It uses domestically produced glass, with a relatively good transmissivity, but it may give off gas under vacuum, so it has to be roasted at 300-400°C for an hour to remove gas adsorbed on the glass surface, and a barium-titanium evaporation type gas removal agent must be used to maintain a high vacuum. During development of the vacuum type collector, the researchers investigated a selectively absorbing film, and concluded that electroplated black nickel is a low-cost good selectivity coating. Figure 6 [not reproduced] shows an experimentally-developed vacuum evacuated glass tube, and Figure 7 [not reproduced] shows the testing of an evacuated tube water heater.

#### Solar Heating, Air Conditioning and Refrigeration

Research in this country on solar heating, air conditioning and refrigeration has also made advances. Several types of active and passive solar buildings are being tested, and studies of solar air conditioning have been conducted. Many organizations have already conducted successful experiments with solar refrigeration and ice making, but there has not been much practical utilization. Accordingly, research and experimentation on solar heating, air and air conditioning, and in particular on passive solar houses, should be stepped up, and it seems that system research and practical utilization of ice production should be given special attention.

The Gansu Institute of Natural Energy Sources and Zhongxing Commune, Minqin County, have jointly carried out experiments on the principle of the French Trombe passive solar house and have built a house with a usable area of 30 square meters whose south wall is made of 370 mm thick masonry, while the remainder is earth walls with papier mache ceilings. On the south wall are installed two 8 square meter air collectors with a glass cover. The south wall is painted black to function as a heat absorber and collector, and two 250 x 170 mm air passages are opened in the wall. The design is as shown in Figure 8 [not reproduced]. Starting in November 1977, the house was tested for 121 days, with excellent results. The region has a cold climate, but only 80 kg of coal



was used as supplementary fuel for the entire winter, with primary reliance on solar heating through the cold season. If two collectors are used to heat 10 square meters, the maximum room temperature can reach 26.4°C, and the lowest room temperature can be maintained at 9°C. This heating design involves an additional 5 yuan of investment for every square meter of living space. But this experiment is merely a preliminary one, and there are still some shortcomings, such as an excessively high temperature variation indoors, which require improvement. Figure 9 [not reproduced] shows a passive solar house which is undergoing testing. An active solar house, a 1-story 3-room design, was erected in the same location. The usable area was 39.3 square meters, the wall was 24 cm thick hollow masonry, and the room surfaces were prefabricated concrete panels. The heat collector circuit supplied hot water from thirteen 2-square meter tube and plate collectors to a 3-cubic meter storage tank. Other than use of a water pump to pump water to the collector, natural circulation was used. The rooms used floor-type diffuse radiative heating. Preliminary testing was carried out in the winter of 1978 with some success. Figure 10 [not reproduced] shows an active solar house.

The Qinghai Standard Construction Design Office has designed and built a 5-story office building in Xining. The building has a total area of 3,274 square meters, with solar heating equipment used for 702 square meters. Combined passive and active heating was used. A south wall collector window and the building's own collection and storage capacity were utilized, and at the same time a collector was used to provide heat. It is claimed that 85 percent of the required heat can be provided by the systems in the winter, with the active and passive systems each providing half the amount. Tests were made in January and February 1979, and the design requirements were met.

Many organizations such as the East China Institute of Engineering, the Henan Provincial Coal Mine Design Institute, the Beijing Municipal Institute of New Technology and the Beijing Construction and Installation Company, the Nanchang Scientific Research Institute, the Ningbo Dongfanghong Cloth Factory and Tianjin University have all experimented with solar ice production. Some equipment was shown at the exhibition.

Cooling equipment includes a solar collector, an absorber, an evaporator and a condenser. All methods tested so far use ammonia absorption cooling. But there are two types, intermittent and continuous. The intermittent type absorbs solar energy in the daytime and uses it for cooling at night. The Beijing Municipal Equipment Installation Company and the Beijing Research Institute of Chemical Engineering have experimentally developed such equipment and have successfully tested it. The performance figure currently achieved is 4.5-5.3 kg of ice per square meter of collector, with an ammonia solution concentration of 54 percent. The device is shown in Figure 11 [not reproduced]. It is provided with wheels so that it can be moved about. The manufacturing process is simple, and each unit costs about 1,000 yuan to produce. It can be used in rural villages or areas with no electric power. Based on this, these units and the Beijing Institute of New Technology and the Beijing Industrial University cooperated to develop a solar refrigerator using a flat plate collector and a tracking device. By increasing the collector temperature, they can now produce ice in the daytime, and have achieved their goal of continuous operation. The flat plate collector has

an area of about 8 square meters, and the refrigeration capacity is 1,000 kcal per hour; the refrigerator temperature can reach 5°C in summer. The East China Institute of Engineering began its research on solar ice production in 1976, and in 1979 it improved and serviced its equipment, which has now been put into operation in intermittent refrigeration; in sunny weather the inside temperature of the refrigerator differs from that of the surroundings by as much as 36°C, or by a minimum of 22°C. The device is shown in Figure 12 [not reproduced].

The refrigerating installation developed by the Henan Institute of Coal Mine Design and the Jiyuan Coal Mine is relatively large, with a collector plate area of as much as 50 square meters, and has a cooling capacity of 2,321 kcal per hour. It has just been constructed, and during testing it produced 15 kg of ice in a day.

As regards solar air conditioning, such organizations as the Guangzhou Institute of Energy Sources, the Air conditioning Department of the Beijing University Institute of Construction, the Chongqing Institute of Construction Engineering and Chongqing University are actively pursuing work in the problem.

#### Use of Solar Energy in Agriculture

Research on the use of solar energy in agriculture has made gratifying progress. In particular, the scope of research and experimentation on solar drying has been extensive, and experimentation is under way not only with the drying of grains and cereals, but also with the drying of agricultural sideline products and wood. Epoch-making drying equipment based on our country's needs has been developed. Although it is not fully adequate in terms of economics, structure, layout and theory, it will be studied and further developed. However, the laying of this foundation is particularly commendable. But not much research work is yet under way on solar irrigation pumps. There are some other extensive areas, such as seed breeding and insect control, in which more penetrating research must be done.

Grain and cereals drying is an important stage in the grain industry, and as the Harbin Municipal Research Institute of Grains pointed out, most of the direct drying methods which use coal both consume energy and can affect grain quality. The drying of product grain also presents a problem as regards grain protection. Because the moisture content of product grain processed in winter is high, by spring it generally begins to heat up and mold, causing great losses. Moreover, such grains as husked rice cannot be directly dried in a coal-burning drying oven. Accordingly, current drying methods do not meet requirements, and the solar drying method is capable of solving both of the abovementioned difficulties.

The drying machines that have already been developed and tested have come primarily from the grain storage departments. The Yantai Grain Office, Shandong, began development work in 1976, and by 1977 had developed the TH-8 moving solar dryer. In 1978 it made improvements and added a tracking mechanism, producing the TZh-40, shown in Figure 13 [not reproduced]. It uses a columnar parabolic mirror and concentrates the sun's rays on a revolving drum through which the grain flows,

raising its temperature and making it possible to achieve the twin aims of decreasing moisture and killing insects. The total reflecting surface of the parabolic reflector is 40 square meters. Drying experiments indicate that when the air temperature was 27-29°C, the temperature of corn on introduction was 24-26°C, and the moisture content was about 12 percent, the output temperature was 56-58°C and the moisture content had dropped to about 10.5 percent. The capacity is 1,270-1,380 kg per hour. The Xingtai County Storehouse, Hebei Province, has also developed a grain drying machine, in which the focusing principle is similar to that of the Yantai machine. Its main distinguishing feature is that after the grain is warmed in the revolving drum, it enters a "recovery cooling system." The system includes a recovery tank and a cooling trough and is helpful in decreasing moisture content. The grain temperature reaches 40-60°C, and the moisture reduction is 1.5-2.5 percent, with insect killing effectiveness about 95 percent. The Xingtai TM-90 solar grain dryer is shown inside the front cover [not reproduced]. Its daily capacity is 20-25 tons.

The Jilin Provincial Institute of Agricultural Machinery and the Grains and Oils Research and Inspection Institute have jointly developed a combination solar dryer and far infrared dryer which uses a 5 square meter columnar parabolic reflector and a 10 kW far infrared drying unit. Preliminary experiments have shown that in both slow low-temperature drying and rapid high-temperature drying of grains, the dryer improves efficiency and decreases electric power consumption, being capable of saving more than a third on electricity. The combination unit is shown in Figure 14 [not reproduced].

During the development process a question of universal significance was brought up. Because the grain drying business is extremely seasonal, if grain dryers are used only to dry grains, their period of utilization is very short, so it is possible that the energy collected in several years' operation is less than the energy consumed in producing the machine, including the materials it contains. This not only is uneconomical but does not help save energy. Accordingly, in solar dryers the collector and the drying section should be separate and a way of using the solar collector part year round should be devised. This problem appears extremely important since it involves the direction of development of solar equipment.

The China Agricultural Engineering Research and Design Academy and the Daxing County Institute of Agricultural Machinery have conducted tests on multiuse agricultural solar devices in Daxing County, Beijing Municipality. Using a flat plate collector with a surface area of about 74 square meters, they built a glass solar greenhouse with an area of 194 square meters, in addition to which they set up two cylindrical grain drying containers with diameters of 4 and 6 meters. In winter and spring this set of equipment is used as a solar greenhouse, and in summer and fall it is used as a solar dryer; it can ordinarily be used to supply water to a shower room. This multiuse installation has just been set up and some preliminary tests were made, but the conception was exploratory in character and it can be considered as a program for solving the problem of year-round solar collector use described above. It would also seem that the columnar parabolic collector would have a wider range of uses than the flat

plate type. Nanchang City Scientific and Technical College has produced a combination solar and methane powered drying installation used to dry agricultural products, which has produced some good results in tests.

In its use of solar power to dry agricultural products, Shandong Province has already made excellent progress and has discovered some superior qualities of solar drying. Jishan County, Shanxi, set up a solar drying shed 9 meters long and 5 meters wide with its glass inclined at  $36^\circ$  and a usable surface of 54 square meters. The single layer of glazing emitted light, the north wall was insulated, and the south wall was also appropriately provided with glass to admit sunlight. A semi-mechanized drying frame was installed inside the shed. This drying shed has already been in use for 2 years and has dried more than 30,000 jin of red dates. The color of the product is bright red and the quality is better than that of sun-dried or oven-dried dates. This drying shed is also used to dry other fruit such as apricots and plums. Solar drying equipment can also be used for drying tobacco. The Institute of Mechanics and the Henan Province Machinery Research Institute constructed a solar dryer in Changge County, Henan, in 1977 to cure tobacco, and after continuing research and improvement, in 1978 they set up a combined solar and coal-burning drying shed which could carry out the complete tobacco drying process. The usable area of the solar drying shed is 50 square meters and the quality of the experimentally cured tobacco was excellent. The drying shed is of simple design and is shown in Figure 15.

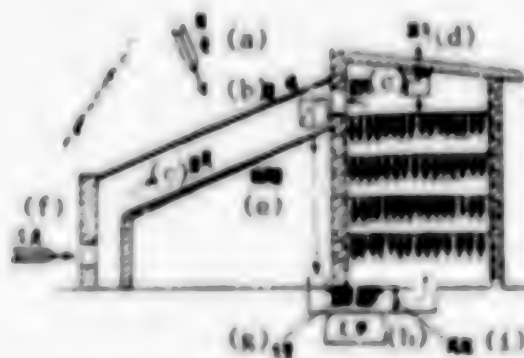


Figure 15. Combination dryer structure for curing tobacco

Key:

- |                       |                |
|-----------------------|----------------|
| (a) sun's rays        | (f) cold air   |
| (b) glass             | (g) fire tubes |
| (c) air return        | (h) furnace    |
| (d) air outlet        | (i) blower     |
| (e) absorbing surface |                |

In all solar drying installations there is a moisture problem; the Yantai and Xingtai grain dryers described above as well as the drying sheds all failed to solve the problem efficiently. It is clear that if forced air ventilation is used, heat will be lost and efficiency will decrease. If the unit is tightly closed or natural ventilation is used, it is difficult to remove the moist air and prolonged curing or drying will be necessary, and the drying results may



even suffer. Accordingly, the solar drying process includes some theoretical problems meriting investigation. Jiangxi Normal Academy has carried out preliminary studies on this problem and has conducted some experiments. It has developed experimental box type, chimney type and natural ventilation type solar dryers, and carried out experiments with the drying of various agricultural products. But the experiments indicated that they had still failed to solve the moisture removal problem, and accordingly they held a discussion and made suggestions for improvements.

Xia County and Linyi County, Shanxi, have experimented with focused pulse solar seed breeding; their seed breeding machine uses a columnar parabolic reflector similar to that used in grain dryers. The seeds are turned over in a rolling drum in the focal region and receive intermittent radiation. In 1977 they conducted experiments on cotton and corn and obtained rather good results. In 1978 they disseminated them for testing, and several dozen units carried out experiments with cotton, corn, wheat, millet, soybean and vegetable seeds, achieving a certain increase in yield in all cases. It is worth pointing out that all these are straightforward comparison experiments which aim both at studying the basic theory of irradiation of plants and at a deepened study of the equipment and of the effects of such factors as the concentration of light, length of irradiation and period of intermittency on the yield. In addition, research has also been done on solar heating of pens in pig raising and solar heating of water in fish ponds for agricultural use.

The Beijing Institute of New Technology and the China Scientific and Technical College have done some theoretical analysis regarding solar irrigation pumps, and have made an analysis of the Stetlin (2448 3676 2651) cycle as a water pump heat mechanism.

#### Other Uses of Solar Heat

Our country has also achieved many scientific results in other uses of solar heat.

Experimental installations for solar drying of wood and the use of solar energy to cure concrete are already in existence. The Research Department of the Daqing Construction Company used a wooden collector made of boards 2 cm thick with its inner walls blackened with ink, with a glass or plastic cover, and surrounded by 10 cm thick perlite insulation to maintain the box at an average temperature up to 60°C. Initial tests indicate that given an average exterior temperature of 20°C, and an initial curing cycle of 8-9 days, using solar energy the curing process can be decreased to 4-5 days. Cured structural members have good strength and the proper color and have not exhibited water loss, cracking or contraction on drying. The China Scientific and Technical College has designed a solar wood drying kiln consisting of a collector, a drying chamber, a storage-collector and a storage tank; a flow diagram is shown in Figure 16. Its distinguishing feature is the collector (diagrammed in Figure 17). This kiln can dry 4.1 cubic meters of wood per load. Generally natural drying is used for wood, with the moisture content decreased in 7-10 days to the fiber saturation level (approximately 30 percent moisture). But to further decrease the moisture content by natural drying requires storage for a very long period. The purpose of

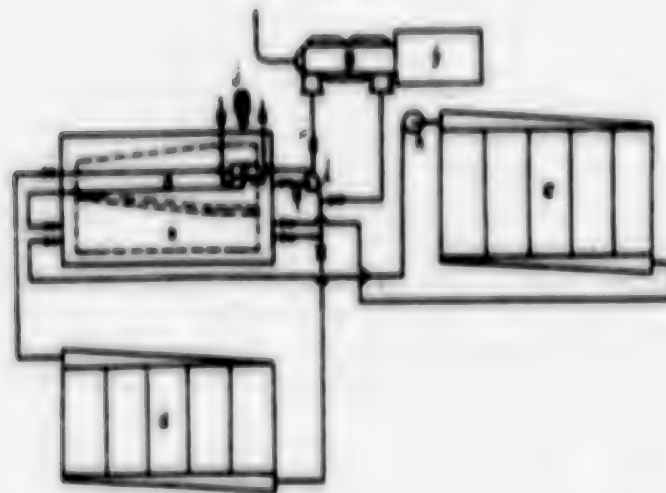


Figure 16. Flow diagram of wood drying kiln

Key:

- a. drying chamber
- b. heat storage chamber
- c. air mixing tank
- d. main collector
- e. storage-collector

- f. furnace using wood scraps
- g. smoke-air heat exchanger
- h, i. centrifugal blower
- j. axial blower

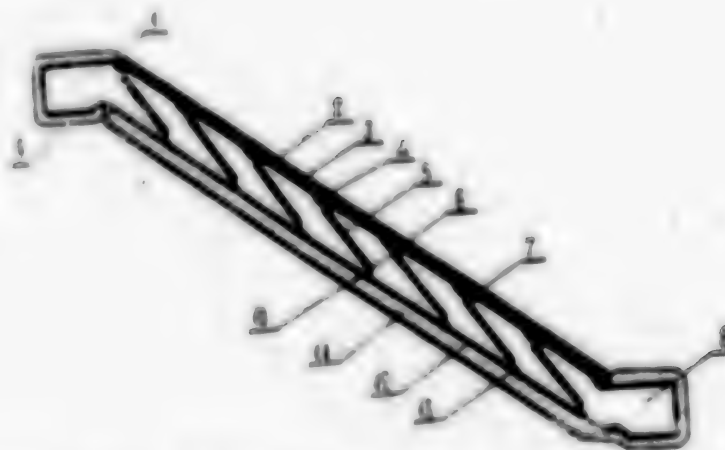


Figure 17. Collector of drying kiln

Key:

- 1. outlet box
- 2. first layer of glazing
- 3. second layer of glazing
- 4. wood frame
- 5. perforated plate
- 6. filler strip

- 7. upper support
- 8. outlet box
- 9. Box insulation layer
- 10. backing
- 11. insulation
- 12. back wall
- 13. lower support

the wood drying kiln is to bring the moisture content down from 30 percent to 14 percent, near the equilibrium water content, in a short time. Accordingly, a solar wood drying kiln is highly useful for woodworking plants. Fuyang, Huoshan and other counties in Anhui Province have already built experimental kilns. Of course, these experimental kilns still require alteration and improvement. The Guangzhou Energy Institute has made experimental studies of air collector for use in drying wood.

The China Scientific and Technical College has developed a solar sterilizer consisting of a conical reflector and a sterilizing cylinder, as shown in Figure 18 [not reproduced]. Because it can be used for high temperature sterilization at a certain pressure, the time required can be greatly shortened.

The Jilin Medical Institute has developed a simple solar infrared physiotherapy machine designated the JTL-1, which is shown in Figure 19 [not reproduced]. The treatment temperature in this machine is 37-45°C, and the radiation supplied is in the 0.7-2.5 micron range. The infrared radiation flux delivered is higher than that delivered by electrical IR physiotherapy devices. Clinical tests indicate a short-term effectiveness rate of 95.1 percent.

Several units, such as the Dukou No 19 Metallurgical Construction Company, Sichuan, and the Qufu Normal Academy, Shandong, have developed solar steam boilers. The Dukou solar steam boiler is shown in Figure 20 [not reproduced]. It uses a spiral tube structure, so that it can rapidly produce evaporation. The parabolic reflector used has a diameter of 4 meters, and the temperature at the focus is as high as 1,050°C. But this is just a preliminary trial, and experimental results in continuous operation and actual use have not yet been obtained. The Qufu Normal Academy developed its solar boiler jointly with the local supply and marketing cooperative. The parabolic reflector is 8 meters in diameter, and the temperature at the focus can reach 1,150°C. It can produce 18 kg of steam in an hour at a maximum pressure of 4 atmospheres, and it has already been put into practical use in the processing of pickles and in providing steam for a dining hall. The Solar Energy Office of the Xi'an City Scientific and Technical Committee has built a solar boiler with a 6 meter parabolic reflector at the Xi'an Zoo. The reflective surface is made of small glass mirrors, and the boiler power is over 10 kW; it can produce 20 kg of steam an hour.

The Haian County Institute of Solar Energy Use, Jiangsu Province, has already provided three solar welders. The TH-773 welder is shown in Figure 21 [not reproduced]. Its reflector is 2.5 meters in diameter and the focal area is 30 mm in diameter. The maximum temperature is 2,000°C, and it can weld 25 x 25 mm cutting tools less than 175 mm long in about 3 minutes. The welder has already undergone preliminary testing.

The South China Engineering Academy has set up two solar furnaces, models I and II, at the school. The two furnaces use searchlight reflectors as collectors. Model I is shown in Figure 22 [not reproduced]. Its parabolic reflector is 95 cm in diameter, and uses an electric tracking motor. The temperature in the heating area has a gaussian distribution, with a maximum of 3,000°C. A testing clamp is fitted above the furnace and can be used to test high temperature materials, to weld platinum-platinum-rhodium thermocouple contacts and to heat high melting point crucibles.

The Guangdong Energy Research Institute has developed a ceiling-type seawater desalination device which has been set up on Gongwuzhou Island, Hainan. The reflector area is 385 square meters and the daily fresh water output is 1 ton. Later a 58 square meter experimental desalination device was built in on Zhong-jian Island in the Xisha chain and a 7.8 square meter water desalination device on Yongyu Island. These experiments showed that solar desalination was practicable. But thorough research into efficiency and economic capabilities is still needed. Expanded tests have already been carried out.

In order to carry out scientific research on the utilization of solar energy and to expand its applications, it is highly necessary to develop solar energy simulators, instruments for measuring solar radiation and instruments for measuring other characteristics. At present, little work has been done in this area in our country. Plant No 529 of the 7th Machine Building Ministry has proposed to develop a solar simulator and Research Institute No 322 in Jinzhou has developed a combination solar radiation telemetering and recording device.

Relatively little work has been done in this country on energy storage and hydrogen production. The Dalian Institute of Chemical Physics has begun studying hydrogen production by catalytic photolysis of water, and it believes this to be a promising storage approach. The Institute of Photosensitive Chemistry is currently carrying on work on hydrogen production by photolysis of water. The Gansu Institute of Natural Energy Sources has conducted tests on solar energy storage in brine ponds.

#### Photovoltaic Use of the Sun, and Solar Cells

The development and popularization of a solar electric fence is a rather striking achievement in solar photovoltaic cells by our country which is of great importance for the expansion of our country's livestock industry and the development of grasslands. The China Agricultural Engineering Research and Design Institute No 6 of the 4th Ministry of Machine Building, the Xinhai Lamp and Lantern Plant in Shanghai, the Chengdu No 3 Radio Plant, the Inner Mongolia Electronics Research Institute and the Jilin Special Products Research Institute have made a major effort and have developed solar electric fence equipment. This equipment uses direct current produced by a solar battery to feed a pulse generator which powers the electric fence. After livestock have once come in contact with the fence, they do not dare approach it again, so that livestock can be raised in an enclosure or grazed in separate areas. The solar cell bank was developed by the Xinhua Lamp and Lantern Plant, Shanghai. Its area is 720 square centimeters; the short circuit current is 1.5-1.8 amperes, with an open circuit voltage of 14.8 V. It is equipped with a tracking mechanism, and the solar cell bank can be kept constantly pointed toward the sun. The pulse generator was developed by the Chengdu No 3 Radio Plant and the Inner Mongolia Electronics Research Institute. These devices were tested by the Jilin Special Products Research Institute in a deer grazing area, with large and small enclosures; the large enclosure had a perimeter of 6,000 meters. The primary purpose of the tests was to observe the deer after they were shocked by the pulses, to find the proper fence structure, and to test the characteristics of the power source and pulse generator. In addition, electric fences from Australia and New Zealand were used in comparison



tests. The test results were excellent. The product experimentally developed in this country had characteristics approaching those of the foreign products, but it was rather unwieldy and not easily portable.

The Scientific and Technical Committee of the Ministry of Railroads has used a silicon solar cell in railroad signal equipment with successful results. Our country's railroads are of immense extent, with nearly 5,000 stations, and some have no AC power source, so that storage batteries or even oil lamps have to be used for the signal equipment, which is both uneconomical and deleterious to safety. In 1975 the Guangzhou Railway Office and the Guangzhou Institute of Electromechanics tested a solar cell on a warning signal device in the Loudi rail yard. Later the Ministry of Railroads installed a 600 watt silicon solar cell as a power source for signals at the Ketu Station on the Qinghai-Tibet Railroad, obtaining excellent test results. Use of solar powered rear signal lights gives a longer visibility range, which improves traffic safety. Currently 50 stations have already installed solar cells. But at current prices solar cells are more expensive than storage batteries, the initial investment is larger and the efficiency is not high, so that their use has been limited.

Another area of use of silicon solar batteries is on navigation markets, for which they are already being extensively tested. The Tianjin Navigation Routes Bureau is already using solar cells on 13 light buoys. The power of the bank currently used is 14.7 watts; it powers 9-watt flashing lights which are illuminated for 0.3 seconds and dark for 2.7 seconds, using a 100 ampere-hour nickel-cadmium storage battery. The cells have already been tested for a long period and have shown their reliability. In 1977, the No 1418 Research Institute and the Tianjin Navigation Routes Bureau jointly developed a 290 watt solar cell bank as a lamp pole source for a 150 watt bromine tungsten lamp. After 2 years of test operation it is considered to be reliable.

In addition, solar batteries are also used as communications power supplies. For example, the DT6-1 solar communication power supply developed by the Fujian Province Postal Research Institute can provide 12/24 volt power to rural single-wire and three-wire carrier wave telephone equipment. This equipment uses a Wensidum [phonetic] collector device, which decreases the amount of silicon wafers required and increases output power. In tests with the solar battery, the voltage was stable and the operating characteristics were excellent. Figure 23 [not reproduced] shows the communications power source.

Several plants in this country are already producing silicon solar cells; most of them are using reject monocrystalline silicon as a starting material, and although efficiency is rather low, the cost is also low. The Kaifeng Solar Cell Plant, which described its experiences at this experience-exchange conference, had great difficulty in getting started, but currently is producing low-cost high-quality silicon solar cells. The conversion efficiency of the solar cells which this plant produces from reject monocrystalline silicon has already been increased from 5 percent to 10 percent, and some of the wafers have an efficiency as high as 12.05 percent.

However, our country's current technology for silicon solar cell manufacture is still at a rather low level, and investigation of various new types of technology is under way, while efforts are also being made to develop a new type cell.

The Tianjin No 1418 Research Institute has already made excellent progress in its research on improving solar cell efficiency, with its top samples reaching more than 15 percent, while the maximum figure for the matte surface cells which it developed is 14-14.5 percent (AM<sub>0</sub>). It has also developed an MIS solar cell which, although at present it has an efficiency of only 3.1 percent, has promise for the future. Because the process for producing the MIS cell is much simpler than that for monocrystalline PN junction cells, it may be possible to lower the production cost of silicon solar cells considerably.

In order to improve silicon cell banks, the Xinhua Lamp and Lantern Plant, Shanghai, has proposed the use of reflector cells. A flat reflector can be used. The plant has already developed a solar powered black light insect trap lamp using such a solar reflector, whose production cost was greatly decreased owing to the fact that it used fewer cells. Figure 24 [not reproduced] shows the TH769-2 solar powered black light insect trap. While on display at the exhibition, the device attracted the attention of American experts who thought it could be used extensively in trapping and killing harmful insects. Another concentrating method is the use of a Fresnel lens. The plant has also experimentally produced a Fresnel lens concentrator solar cell bank with a light gathering power of 12 and a power output of 28 watts, which greatly decreases the number of silicon wafers used, from 1,400 (10 x 20 mm wafers) to 144, thus greatly decreasing production costs. Foreign experiments have been conducted on the use of solar cells to produce both electricity and heat. Silicon solar cells cannot withstand high temperatures, so that if a parabolic reflector is used, and the light gathering power is high, when the temperature becomes high water cooling may be used and the resultant hot water can also be utilized. This method may be a possible approach to high power silicon photocell banks. Currently no experimentation on the subject has been pursued in our country.

The Guangzhou Institute of Electrical Engineering has carried out studies on series and parallel connection of solar cells and their combination with storage batteries. A bank of solar cells was combined with a manganese-zinc battery in a lighthouse at the Zhongshan Point ship passage, Guangdong. It has already operated normally over a long period. The Zhangzhou No 1 Radio Plant, Fujian Province, improved solar cell grid connections, increasing efficiency. The solar bank produced by the plant has been used as a power source for a television differential rotator.

A research development in new solar cell technology which has already achieved some success is the matte surface solar cell developed by the Xi'an Communications College, in which reflection losses are greatly decreased, resulting in a rather large increase in the efficiency of the cell. In initial testing, the matte surface cell capabilities were excellent.

Research has already been done in this country on ion injection NP silicon solar cells, with some success.

Such organizations as the Changchun Institute of Applied Chemistry, Zhejiang University, the Shanghai Institute of Silicates, and the Shanghai Lamp and Lantern Plant have already investigated cadmium sulfide cells for a long period and have made progress in both increasing conversion efficiency and improving stability. Some research has also been done on gallium arsenide cells.

#### Solar Heat Power Generation, Basic Theory and Materials

The development of applied solar technology and attention to current applications such as solar ovens, solar hot water heaters, solar drying equipment and the like can unquestionably result in savings of conventional energy sources and provision of urgently needed power and thus is very important. But taking the long view, utilization of solar energy cannot remain too long in the auxiliary power source stage. As technology advances, and in accordance with the requirements of the energy situation, solar power will gradually become an important energy source. Accordingly, basic research is also very important, and some organizations in this country have already done work in this area and have made some progress.

Analyzed in economic terms, solar heat use in electric power generation is currently of little value. The fact is that collecting the solar radiation requires an immense installation which consumes large quantities of materials, and the construction costs far exceed those of conventionally powered or nuclear power stations. But from another viewpoint, because the technological requirements are high and the difficulty great, it requires a relatively long period of technical preparation, and it seems highly necessary at present to start some small-scale experiments focusing on materials and components and basic theory. Currently, the Shanghai Machine Building Institute, Tianjin University, the Institute of Electrical Engineering, and Qinghua University are already pursuing experiments and research in electric power generation with solar heat or are beginning such work. The Shanghai Machine Building Institute began power generation experiments in 1975 using a combination of a flat plate collector and a columnar parabolic collector. An experimental installation with a capacity of 1 kilowatt has already been completed and has achieved the predicted characteristics in tests. The 1 kW solar power station is shown in Figure 25 (not reproduced). This experimental power station has already been used for optical experiments, water heating measurements and air conditioning experiments.

Tianjin University is also about to construct a 1 kW tower type solar power station. During the construction process, all components were tested, the geometric characteristics and heat transmission characteristics of the light absorbers were investigated, and a mechanical drive for the tracking system, a stepped motor for the tracking system and a power supply for the stepped motor were developed, laying the foundations for the construction of an experimental power station.

The Electrical Engineering Institute is beginning extensive theoretical studies for selection of a solar heat electric power generation program. It has already submitted a preliminary theoretical analysis of the characteristics of the defocusing of a parabolic reflector resulting from oblique light incidence, an analysis of the heat collection characteristics of a mixed collector, and of a



heliostatic tracking scheme. More important, it has made a proposal to investigate "natural energy resource ensemble," which is generalized comprehensive utilization of solar energy. Depending on the different natural conditions in the various regions of the country, this ensemble can include solar energy, biomass energy, wind power and small electric power stations, can exploit the advantages of various power sources and supplement their shortcomings, and can convert them into electric power and supply it to mountain regions, the countryside and outlying districts. The installations which combine several different energy sources described above may serve as prototypes for this natural power ensemble.

As regards the collection of solar heat energy, the investigation of solar heat power is not limited to the generation of electricity; it can also be used for irrigation, air conditioning and other areas which require high or medium temperatures.

The Shanghai Automotive Parts Repair and Supply Plant has produced a Sitelin heat engine which it exhibited at the exhibition, attracting considerable attention. It is shown in Figure 26 [not reproduced]. The heat engine was combined with a JF-11A silicon DC generator for tests, and it successfully produced electricity. Combined with a 2.5-meter diameter dish type parabolic reflector, the heat engine uses nitrogen as its working medium; it produced 42 watts of electric power in May sunlight in Shanghai.

With regard to the theory of electric power generation with solar heat, Nanjing University has proposed a key question with regard to solar heat electric power generation efficiency, and the Institute of Electrical Engineering has submitted articles on the principles and testing of a magnetic field modulation variable-speed constant-frequency stable-voltage generator.

Much research work has been done on materials. The Shanghai Institute of Silicates has made considerable progress; with regard to selective absorptive coatings, it developed a matte coating with an absorptivity  $\alpha_s$  greater than 0.95. The absorptivity of this coating is independent of the angle of incidence of the solar radiation and is suitable for flat plate collectors. It has also developed electroplated black nickel which can be used on medium temperature solar collectors at 120-160°C with an  $\alpha_s/\epsilon_h$  ratio of 6.5, suitable for air conditioning and cooling. Research is also proceeding on some new absorbing materials. In the materials area, it has developed direct vacuum aluminizing of glass fiber reinforced plastic sheets, and the use of an organosilicon resin as a protective layer with a reflectivity as high as 0.9. It has also developed a shiny anodized reflective surface. As regards insulating materials, it has developed a polyester or polyimide film which is aluminized on both sides and a laminated insulating material made of nylon or polyester netting which can be used at 100-150°C. There is also a laminated insulating material consisting of nickel foil and alkali-free glass fiber cloth which can be used to 800°C.

In order to investigate combination of solar collectors and improvement of their efficiency, much effort has been spent in investigating selective absorption coatings and determining their capabilities. The Coatings Research Department of the Tianjin General Paint Plant has carried out tests of various black coatings and has concluded that the absorptivity of coatings is not only related to



the base material and the filler of the paint, but even more importantly is related to the absorbing pigment. Some black paints with excellent absorption characteristics also have high emissivity and accordingly are not selective. The plant has already developed a relatively good selective coating material. The Beijing Institute of New Technology has determined the absorption characteristics of black lead sulfide asphalt coatings; the Beijing S Chemical Engineering Academy has also investigated lead sulfide selective coatings. The No 6 Design Institute of the 5th Ministry of Machine Building has carried out research on copper oxide coatings, the Beijing Institute of New Technology on black chromium coatings, Wuhan Institute of Building Materials on black nickel coatings, and the Institute of Mechanics on iron oxide coatings. These coatings all require testing in actual use, because the coating requirements of collectors for different purposes are different; and more importantly, it is necessary to carry out technical and economic analysis and determine their characteristics and their ranges of use. The characteristics of these coatings are shown in the following table:

#### Characteristics of Experimental Coatings

Name of Selective Coating	Developer organization	$\alpha$	$\epsilon$	Remarks
Lead sulfide	Beijing Chemical Engineering Academy	0.85-0.91	0.23-0.40	Spray painted, usable to 260°C
Iron oxide	Institute of Mechanics	0.89-0.85	0.17-0.13	By immersion. Sodium nitrate used as oxidizer, 3 minutes treatment at boiling temperature of 123°C
Black chromium	Beijing Institute of New Technology	0.94	0.10	Electroplated; has excellent heat resistance
Black nickel	Wuhan Academy of Building Materials	0.87	0.061-0.064	Electroplated over an electroplated silver layer; already used experimentally on solar boiler
Copper oxide	No 6 Design Institute Fifth Ministry of Machine Building	0.88	0.19	Produced directly on copper items by oxidation, or by copper plating followed by oxidation; copper oxide surface is polished

Our country has not yet done much theoretical research on use of solar power; most of what has been done has emphasized theoretical studies of measurement and testing and combined utilization. A teacher in the Xi'an No 30 Middle School has carried out theoretical analysis and research on fixed-mirror solar energy concentration, and has proposed the use of the principle of flat stepped lenses in solar power (the article has been published in the journal WULI (PHYSICS)). Qinghua University has done some investigation in heat engineering, and has produced articles on using the exergic parameters to evaluate the performance characteristics of collectors, on exergic analysis of stage matching of solar motive power installations and on calculation of the solar reliability factor  $f$ . Some studies of testing methods and instrumentation have been made; the China Scientific and Technical College has investigated unstable state calorimetry to determine the strength of solar radiation, the Guangzhou Energy Research Institute has investigated calculation of the angle of incidence of solar radiation on an inclined surface, and Plant No 509 of the 7th Ministry of Machine Building has investigated a spherical integrator, monochromatic solar energy absorptivity measurement, and a calorimetric method of determining hemispherical radiativity. Basic theoretical research will become steadily stronger as questions arise during the process of utilization of solar power, and under the guidance of theoretical research it will be possible to conduct research and development, particularly as regards solar radiation and electricity.

The foregoing shows that technology for the use of solar energy has developed rather rapidly in this country, but it must also be recognized that at present we are just beginning, and accordingly much work still remains to be done. We should like to quote Vice Chairman of the State Committee on Science and Technology Wu Heng [2976 5899] to conclude this article: "At present, converting solar energy to heat energy or the use of solar cells to convert it directly into electrical energy does not involve any special technical difficulties. The reason why it cannot be put into extensive use is primarily that the cost is still higher than that of conventional energy sources. Accordingly, we should strengthen our basic theoretical research, carry out intermediate testing well, and grasp the key aspect of materials research, doing everything possible to raise the efficiency of equipment for using solar power and to decrease its cost. Scientific and technical workers should be good at linking up with the results of developments by the masses, should persist in acquiring materials locally, should base themselves on the real situation in our country, should take the route of using solar energy themselves, should carry on their work steadily and persistently solve problems, and should strive to make the work of utilizing solar energy develop in a healthy fashion."

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## MINERAL RESOURCES

### HUGE URANIUM DEPOSIT FOUND IN HUAGANG CRAG

Beijing RENMIN RIBAO in Chinese 30 Aug 80 p 1

[Article by Li Weiyao [2621 1218 1031] and Zhang Yousheng [1728 0645 3932]: "Tan Mutao Opens Up a New Realm by Finding Uranium in Stratum of Huagang Crag"]

[Text] Our country has found a large uranium mine in the Mesozoic Era's broken rocky stratum of Huagang Crag. Engineer Tan Mutao [6007 1970 7118], director of the Guangdong Provincial Bureau of Geology, contributed to the discovery and verification of this uranium mine.

In the past, some foreign experts had categorically asserted: "There are no large mineral deposits in the Mesozoic Era stratum of Huagang Crag" and "One cannot drill more than 200 meters into Huagang Crag." A regional geological survey team, however, discovered many unusually radioactive points (belts) in Huagang Crag of the Nanling Mountains. Geological Team 705, whose mission is to find uranium, immediately began prospecting. Tan Mutao, as the technical responsible person on this team, personally directed the prospecting and drilling, and, in less than 4 years, handed over to the state a big uranium mine.

To solve the mystery of whether there was a mineral deposit in the Mesozoic Era stratum of Huagang Crag, Tan Mutao began by summing up his experiences in searching for mineral deposits, and then led the geological personnel in scaling sheer precipices and overhanging rocks in order to investigate outcroppings and drill tunnels, gathering and putting in order several hundred thousand words of firsthand material. After analysis and study, he confirmed that about 1 million years ago there were many violent movements of the earth's crust here (the so-called Yan Mountain Range activity). Huagang Crag, a product of the later period of this activity, contains thermoliquified uranium [youreye 6914 3583 3210], which from deep in the earth's crust runs along a fault line up to the earth's surface, forming a mineral deposit. By mastering a great amount of data, he was able to draw a circle around a 76-square kilometer mineral field and to draw up a 7-year plan for it. From the end of 1965 to 1966, the Ministry of Geology mustered its forces to explore, on two occasions, the No 9 hole picked out by Tan Mutao on the mineral vein. After more than a year, the ministry, overcoming all sorts of difficulties, verified that there was an especially large uranium vein centered on the No 9 hole. From 1967 to 1979, Geological Team 705 handed over to the state large industrial reserves of uranium.

In 1979, Comrade Tan Mutao was a member of our country's uranium geological delegation that went to America, and he attended the annual symposium on uranium of the American Petroleum Geologists Society, at which he read his scientific paper on "Geological Features and Formation of Thermoliquified Uranium in Huagang Crag of the Nanling Mountains." The scientists at the symposium thought highly of and commended his paper. In April of this year, he was elected to be a model worker in the national geological system.

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## MINERAL RESOURCES

### BRIEFS

**HUNAN COAL STOCKPILING**--Hunan Provincial station carried a short commentary on 19 October on solving the problem of coal stockpiling at some mines. The short commentary said: (Yomasi) Coal Mine has done well in the sale and transport of coal, and has not had to stockpile any coal. One of the reasons for stockpiling coal is that the quality of the coal is too poor and the coal does not sell well. Therefore, we hope that all coal mines learn from (Yomasi) Coal Mine and increase their coal production while at the same time improve the quality of coal. In addition, the railway and transportation departments must help in transporting coal in order to solve the problem of stockpiling. [Changsha Hunan Provincial Service in Mandarin 1100 GMT 19 Oct 80]

**HEBEI COUNTY GOLD MINING**--Shijiazhuang, 6 Nov (XINHUA)--Xinglong County, had extracted 2,940 liang gold and some 10,000 liang silver in the first 9 months of the year. [Beijing XINHUA Domestic Service in Chinese 0120 GMT 6 Nov 80]

**XIZANG MINERAL RESOURCES**--The Xizang Regional Geological Bureau has surveyed coal mines, geothermal energy resources, petroleum, copper mines and chromite in Xizang this year. The bureau has also divided these underground resources into districts and compiled a report on the divisions after studying hundreds of geological reports and scientific research treatises and making an overall analysis. [0W121403 Lhasa Xizang Regional Service in Mandarin 1100 GMT 6 Nov 80]

**JILIN GOLD MINE**--The gold geological survey station of the Jilin Provincial Geological Bureau recently verified a medium-sized alluvial gold mine near the (Jinchuan) River in Wangqing County. The gold mine has proved to be easy to exploit. [Changchun Jilin Provincial Service in Mandarin 2200 GMT 7 Nov 80]

**PROVINCIAL JOINT VENTURE**--Guangzhou, 14 Nov (XINHUA)--Two units of Guangdong and one unit of Hunan have jointly set up an iron-manganese mine in February this year. Total investment is about 31,000 yuan. By mid-October, the mine has turned out 5,500 dun of iron and manganese ores. The total output value is more than 240,000 yuan, and the net profit reaches more than 97,000 yuan. At present, over 4,000 dun have been sold. [Beijing XINHUA Domestic Service in Chinese 0315 GMT 14 Nov 80 OW1]

## INDUSTRY

### NEED FOR MOTOR VEHICLE INDUSTRY IMPROVEMENTS DISCUSSED

Beijing RENMIN RIBAO in Chinese 31 Aug 80 p 3

[Article by Meng Xiongfei (1322 7160 7378) of the Urban Construction Bureau, Jiamusi municipality, Heilongjiang: "Manufacture and Use of Our Country's Motor Vehicles Must Be Improved"]

[Text] I have a 47-year history of dealing with motor vehicles, from repairing and driving to managing. I feel deeply that there are sectors in our country's manufacture and use of motor vehicles that urgently need to be improved.

After liberation, our country produced many factory brands and models of motor vehicles, the majority of which were unpleasing in shape and old-fashioned in style. For example, a Liberation car, from its first manufacture up to the present time--23 years--has been the same old model year after year. There have been no big improvements in this car, which is still at the level of the 1940's motor vehicle industry.

There is too much duplication in the test models and the structure of the motor vehicles produced by all plants. Changchun produces the Liberation car and Liaoning the "Liaoning No 1"; Beijing produces the "130," and Shenyang, Dandong, and other cities produce a car similar to the "130"; Jinan produces the "Huanghe" and Heilongjiang the "Longjiang." "I learn from you, and you copy me"--very few new trails have been blazed. Why can't we take in the advanced technology of all car manufacturers and learn from the successful experience of foreign countries?

For urban passenger vehicles, many units like jeeps--the Beijing jeep, Tianjin jeep--Liaoning jeep. These jeeps are well suited for use by the military or by mining and similar units, but as an urban vehicle, its drawbacks outweigh its advantages. The front-wheel drive jeep has an extra gear [fendongqi 0433 0520 0892]. Its manufacturing cost and fuel consumption are high. I have compared the fuel consumption of a Beijing jeep and an imported sedan: the former consumed over one-third more fuel than the latter. Our country has the low-fuel consumption Shanghai sedan. If all cities in the country were to use it, and not jeeps, as a passenger vehicle, there would be a considerable saving of energy.

The urban and rural areas of the country are now, starting in small increments, making a big effort to save energy by installing in cars a series of fuel-saving devices. If, however, they do not grasp the key point, aren't they "picking up sesame seeds but overlooking watermelons," i.e., concentrating on minor matters to the neglect of major ones?

I well know that it will be very difficult to substitute sedans for jeeps. For a long time, especially after the 10 years of turmoil, some cadres have thought that riding in small sedans was a sign of the special privilege mentality and riding in jeeps was a sign of the masses' mentality; they would rather use the high-fuel consumption Beijing jeep than the low-fuel consumption small sedan. Therefore, it is a task of top priority--in line with the spirit of seeking truth from facts and stressing the practical result of saving energy--to change this idea, which deceives oneself as well as others.

Furthermore, we can make checks on jeep distribution. With the exception of military and other necessary uses, the ordinary unit, without exception, should not be supplied with jeeps. As for the jeeps currently in use, we can obtain from the manufacturing plants a supply of ordinary sedans, and afterward from the state recall extra-gear, cross-country jeeps; the sedans will be assembled and exchanged for these jeeps. This action will yield twice the result with half the effort.

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## INDUSTRY

### BRIEFS

**HEILONGJIANG INDUSTRIAL ENTERPRISES**--In Heilongjiang Province, 129 enterprises were selected as experimental units to expand the power of self-management. From January to September, their industrial output value totaled 2,674,000,000 yuan and profits 476 million yuan, 18.1 and 29.4 percent respectively higher than the figures for the corresponding 1979 period. [SK020231 Harbin Heilongjiang Provincial Service in Mandarin 2200 GMT 28 Oct 80]

**ANHUI INDUSTRIAL PRODUCTION**--Anhui's total industrial output value reached 1,025 million yuan in October, marking an increase of 3.1 percent over that of September. The output value for light industrial products in October rose by 9.7 percent over that of September, while the output value for heavy industrial products remained the same. During the third quarter, industrial production dipped due to floods and other reasons. However, the October figures clearly indicate a revival, thanks to the painstaking efforts of the workers in the field of industry and communications. [Hefei Anhui Provincial Service in Mandarin 1100 GMT 9 Nov 80]

**ANHUI WORK GROUPS**--The Anhui Provincial People's Government has recently organized 25 cadres into three work groups to survey the progress made by various localities in the province in implementing the guidelines laid down by the provincial industrial and financial conference. Secretary of the provincial CCP committee Su Yu and vice governors Meng Jiaqin and Huang Yu spoke to the groups prior to their departure for the localities, calling on the members of the work groups to rely on the local party committees and people's governments to help various localities implement such guidelines and fulfill this year's industrial plan. [Hefei Anhui Provincial Service in Mandarin 1100 GMT 9 Nov 80]

**SHANXI COAL PRODUCTION**--Taiyuan, 8 Nov (XINHUA)--As of 27 October, local coal mines in Shanxi had fulfilled the 1980 state coal production plan 64 days ahead of schedule with total output reaching 45 million dun, a 15 percent increase over the corresponding period of last year. According to latest statistics, some 20 million dun of coal have been transported from local mines in Shanxi to other provinces, municipalities and autonomous regions this year. [Beijing XINHUA Domestic Service in Chinese 0706 GMT 8 Nov 80]

**HEILONGJIANG SMALL CHEMICAL FERTILIZER**--Harbin, 10 Nov (XINHUA)--Heilongjiang has achieved great results in readjusting the small chemical fertilizer industry. As of October this year, the province had closed 15 small chemical fertilizer plants. However, the province's small chemical fertilizer output in January-October increased by more than 18,000 dun over the entire 1979 output. In addition, the production costs were reduced. [Beijing XINHUA Domestic Service in Chinese 0215 GMT 10 Nov 80]



NEI MONGGOL RARE EARTH--Hohhot, 10 Nov (XINHUA)--A rare earth dressing plant with an annual capacity of 5,000 tons has been completed, according to the China rare earth company at Baotou in Inner Mongolia. Two smelting workshops each with an annual capacity of 2,000 tons are to be expanded or rebuilt shortly. The company said it met this year's production quota for major products by the end of September. It is now turning out more than 40 products including rare earth alloys and low-grade ferroniobium. Businessmen from France, Japan, the United States and the Federal Republic of Germany have placed orders with the company for 1,200 tons of rare earth products. [Text] [Beijing XINHUA in English 1213 GMT 10 Nov 80]

ZHEJIANG DETERGENT PRODUCTION--As of the end of October, Zhejiang has overfulfilled the 1980 production plan of soap, washing powder, toothpaste and other detergents ahead of schedule. Compared with the corresponding period last year, the output of soap increased by 26.34 percent; that of washing powder 40.17 percent; and that of toothpaste 45.6 percent. Since the beginning of this year, while making every effort to increase production, all Zhejiang's detergent-producing plants have continuously improved product quality. The Xihu brand soap produced by the Hangzhou Dongnan Chemical Works and the Fenghuang brand soap produced by the Lanxi Chemical Works won first and second places respectively at the National Quality Appraisal Meeting. The Xihu brand soap was commended as a fine quality product of the light industry ministry. Xihu brand and Guangming brand toothpastes produced by the Hangzhou Toothpaste Plant won the highest marks at the National Quality Appraisal Meeting. Xihu brand toothpaste was commended as a fine quality product of the provincial people's government. [Text] [OW160723 Hangzhou Zhejiang Provincial Service in Mandarin 0400 GMT 16 Nov 80]

GUANGDONG ENTERPRISES--Since the beginning of this year, commune and brigade enterprises in Poshan Prefecture have developed quickly. By the end of August the prefecture had set up some 18,000 commune and brigade enterprises, whose total output value from January to August was some 630 million yuan, 25 percent more than in the corresponding period of last year. Zhongshan County now has some 2,600 commune and brigade enterprises. Since last year, Taishan County has set up 2,227 commune and brigade enterprises. From January to August, the total output value of all commune and brigade enterprises throughout this county was 35.24 million yuan, 62 percent more than in the corresponding period of last year. Their profits were nearly double the figure of the similar period of last year. [Guangzhou Guangdong Provincial Service in Mandarin 1120 GMT 15 Oct 80]

GUANGDONG INDUSTRY--Guangdong Provincial industrial production showed a large increase this year. From January to September, the total production value was fulfilled every quarter and has increased by 10.6 percent over the third quarter figure of last year. Light industry production value was increased by 16.9 percent over the same period last year and that of industries under the collective ownership system was increased by 22.3 percent. The light industry figures greatly exceeded the growth rate of heavy industry. The Guangdong Provincial Economic Committee recently held a meeting on provincial industrial production in order to insure greater production in the fourth quarter. [Guangzhou Guangdong Provincial Service in Mandarin 1120 GMT 21 Oct 80]

## CONSTRUCTION

### BRIEFS

**HENAN URBAN HOUSING CONSTRUCTION**--From January to September, the housing construction area in urban, industrial and mining districts of Henan Province amounted to 3.37 million square meters, 28 percent more than in the corresponding period of last year. 1.145 million square meters of housing construction was completed, 63 percent more than in the corresponding period of last year. This alleviates the housing problem for about 30,000 households in urban areas. [Zhengzhou Henan Provincial Service in Mandarin 1100 GMT 29 Oct 80]

**LIAONING COMMODITY HOUSES**--Shenyang Municipality, Liaoning Province, is stepping up the construction of commodity houses. Housing with 100,000 square meters in floor space is expected to be completed by the end of 1980. Units to be sold to workers total 46 square meters in floor space. Each square meter is valued at 150 yuan. [Shenyang Liaoning Provincial Service in Mandarin 1100 GMT 5 Nov 80]

**SHANDONG BUILDING MATERIALS**--During the first 9 months of 1980, Shandong Province had fulfilled 126.2 percent of the annual plan for procuring building materials for export, an 18 percent increase over that of the 1979 corresponding period. [SK071030 Jinan Shandong Provincial Service in Mandarin 2300 GMT 6 Nov 80]

**HEILONGJIANG HOUSING**--Qiqihar Municipality, Heilongjiang Province, abolished the regulation prohibiting individuals from building houses in urban areas. By mid-October, 1,400 families had moved into houses built by themselves. The municipality has approved the applications of 1,530 families to build or expand their houses. This construction encompasses 83,000 square meters. [SK102030 Harbin Heilongjiang Provincial Service in Mandarin 1100 GMT 8 Nov 80]

**LIAONING RURAL HOUSING**--In Liaoning Province, 150,000 peasant families have moved into new houses with 450,000 rooms. A 30-year record high. Next year 200,000 peasant families will build new houses. [SK102030 Shenyang Liaoning Provincial Service in Mandarin 1100 GMT 8 Nov 80]

**LIAONING RURAL HOUSING CONFERENCE**--The Liaoning Provincial Rural Housing Construction Conference sponsored by the provincial people's government ended 7 November. The conference pointed out that rural housing construction should be well planned to ensure that no good farmland is wasted. It stated that rural houses are built either with collective investments with the property right belonging to the public, or with individual investments with the property right belonging to individuals. Houses are also built in a unified way with public funds which are sold to individuals.

The conference efforts to assist in providing supplies for rural houses. [SK102030 Shenyang Liaoning Provincial Service in Mandarin 1100 GMT 8 Nov 80]

SHANGHAI CAPITAL CONSTRUCTION PROJECTS--Since the beginning of this year, more than 170 capital construction projects have been suspended or delayed in Shanghai in accordance with the policy of readjusting the national economy, thereby reducing investment by some 300 million yuan. Construction of some 200 new projects has begun this year to meet the needs of the light, textile, handicraft, power, coal gas, housing construction and building material industries, education, health work and environmental protection. Total investments for these new projects amounted to 3.9 million yuan. [Shanghai City Service in Mandarin 2300 GMT 8 Nov 80]

JIANGSU CONSTRUCTION MATERIAL--Jiangying County, Jiangsu Province, runs many small kilns and cement plants so as to achieve self-sufficiency in major construction materials in the countryside. At present, there are 30 kilns and 22 cement plants in the county's 31 communes. From January to September this year, some 400 million pieces of bricks and tiles and 110,000 dun of cement have been produced in the county. [Nanjing Jiangsu Provincial Service in Mandarin 1100 GMT 11 Nov 80]

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## DOMESTIC TRADE

### BRIEFS

**SICHUAN HOLDS DIRECTORS MEETING**--The Sichuan Provincial Changjiang Enterprise Company recently held its first directors' meeting in Chengdu, which decided to absorb and apply foreign investment in a planned way and to increase exports and foreign exchange so as to contribute toward speeding up the four modernizations in the province. The company was established in accordance with the decision of the provincial people's government. It is a state socialist enterprise under the direct leadership of the provincial people's government. "The task of the company are, in accordance with the provisions of the law of the People's Republic of China on joint ventures using Chinese and foreign investment and other relevant laws and regulations, to absorb and apply foreign investment in a unified way, to organize and coordinate talks in a unified way between local enterprises and foreign investors on joint ventures, and on concluding and signing agreements to directly take part in joint ventures, put forward suggestions on relevant laws and regulations on investment and foreign exchange control and give advice on other forms of economic cooperation. The investment projects undertaken by the company will provide greater foreign exchange. The company adheres to socialist principles and acts in accordance with economic laws. The company has been established in Chengdu and its working capital is 100 million yuan. The organ of supreme power of the Changjiang Enterprise Company is the board of directors. The provincial people's government appointed Tong Shaosheng as chairman of the board of directors and (Han Bo) as vice chairman. The first meeting of the board of directors designated (Han Bo) as the general manager and (Ding Hongsheng) and (Yue Yun) as deputy general managers." Since the Sichuan Provincial Changjiang Enterprise Company was established in May this year, it has actively done business with domestic and foreign companies. [HK050631 Chengdu Sichuan Provincial Service in Mandarin 2300 GMT 31 Oct 80]

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## LABOR AND WAGES

### BRIEFS

**LIAONING PERSONNEL INCENTIVES**--A commune in Yi County, Liaoning Province, is able to employ competent personnel by giving them special privileges. Any employees who have special professional skills and who have made contributions to the enterprises may receive excellent wages and benefits in accordance with specific conditions. Household registration records of these employees and their families may be transferred to Yi County on request. Enterprises to which they belong will help them solve housing problems. Children of these employees may enjoy employment preference in commune and brigade-run enterprises. Thanks to such special treatment, 90 percent of the enterprises employing these competent people achieved marked increases in output and profits. In the January-June period alone, these enterprises made a profit of 200,000 yuan, 1.9 times that of 1979. [Shenyang Liaoning Provincial Service in Mandarin 2200 GMT 1 Nov 80]

**JILIN LABOR POLICY**--The Jilin Provincial Labor Office recently commented on the policy of children substituting their retired parents. The responsible person of this office said: This policy was adopted at the fifth NPC Standing Committee session on 24 May 1978. Therefore, it will not change in the future. Rumors that this policy will soon change are groundless. Staff members and workers who plan to hasten their retirement in fear of a policy change must reconsider. Those who do not meet the requirements for retirement should not request for early retirement. Enterprises, establishments and other units must strictly implement this policy according to the regulations of the state council and should not relax policy restrictions. Retired workers at cultural, educational, public health, publication and press units whose children are not suited to work in these fields can be arranged to work in other fields by the labor departments. [Changchun Jilin Provincial Service in Mandarin 1100 GMT 5 Nov 80]

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## TRANSPORTATION

### TRUCK TRANSPORT IN SHAANXI WASTES MONEY, GASOLINE

Beijing RENMIN RIBAO in Chinese 31 Aug 80 p 3

[Article by Sun Yinglin [1327 2503 3829] of the Shaanxi Provincial Transportation Bureau: "Look at the Waste in Our Province's Truck Transport"]

[Text] Our country's civilian freight trucks are now distributed in two quarters: one is party and government organizations, and enterprises and establishments at all levels (in general, these are called public vehicles); the other quarter is all levels of special transport companies. These two quarters are now experiencing the serious problems of too many vehicles and too few goods, too much one-way transport, and trucks being driven while empty.

On a certain day in 1978, we made a traffic check in Xi'an municipality. Of the 1,382 heavy freight trucks being driven on the west main road, 75 percent were empty; of the 1,720 heavy freight trucks being driven on the east main road, over 60 percent were empty. Only taking account of the trucks on these two main roads (we did not check the south and north main roads), there were on this one day a total of 2,102 empty trucks, a waste equivalent to the 7-day transport capacity of the 300-odd freight trucks of the Xi'an Transport Company. Based on the calculation that every empty truck, on average, traveled 100 kilometers and consumed 25 liters of gasoline, then on that day the empty trucks wasted as much as 52,550 liters. The state regulation is that every ton-kilometer of transport costs 2 jiao, and the average empty truck has a deadweight of 3 tons. Therefore, on this one day, more than 126,000 yuan in transport costs were lost. Civilian trucks in the Xi'an area account for about one-third of the total number of civilian trucks in Shaanxi Province. Based on the budgetary estimates for the entire province, each day about 378,000 yuan in transport costs are lost and 17 tons 700 kilograms of gasoline are wasted. Over the years, the total amount of this waste is even more alarming.

The causes of this waste are:

1. There are too many public vehicles, and their transport efficiency is too low. According to statistics for November of last year, Shaanxi Province had a total of 36,689 trucks, each with a deadweight of 2.5 tons and above--among them are 31,441 public vehicles, i.e., 87.1 percent of the total--distributed among 6,088 units. There are only 4,748 special transport trucks, i.e., 12.9 percent of the total, but the annual freight volume of special transport trucks is equal to that of the public vehicles. This shows that the transport efficiency of public vehicles

is only one-seventh that of special transport trucks. It goes without saying that the transport efficiency of our country's special transport trucks is much lower than that of advanced foreign countries, and the low transport efficiency of public vehicles does not bear talking about.

2. The quality of the service provided by some special transport companies is not high, and their bureaucratic way of doing business is a serious cause for concern. Some, when transporting goods, choose their own routes and decide what cargo they will carry; some are irresponsible, losing and "shorting" cargo; and some don't deliver on time. Therefore, some enterprises and establishments are unwilling to let special transport companies haul their goods. This is a serious cause of one-way transport and the driving of empty trucks.

The transport structure is not unified. Shaanxi Province now has over 100 big and small truck transport companies, divided into those managed by the province, the prefecture, and the county. This kind of transport structure, with its administratively divided management, has a serious effect on the "three unities" (unity in arranging goods supply, unity in balancing transport capacity, and unity in managing transport costs) management. It creates a chaotic situation in which each level "draws a circle on the ground and makes 't a prison"; they block each other's goods supply, erect layer upon layer of obstacles, and vie with each other for transport routes.

In order to save more energy, the above problems should be studied and solved.

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## TRANSPORTATION

### BRIEFS

**YUNNAN ROADS CONSTRUCTION**--From January to July of this year, Yunnan Province built and repaired some 2,700 meters of rural roads, which was equivalent to the sum of work for the previous 2 years. At present 1,328 communes are accessible by vehicles. This year, the Yunnan Provincial People's Government has allocated funds and has sent personnel to help do road construction work in rural areas. [Kunming Yunnan Provincial Service in Mandarin 1100 GMT 22 Oct 80]

**SHANDONG RAILWAY PROJECT**--The blueprint for the construction of a railway across southeastern Shandong Province has been completed and approved by the department concerned. This port is designed to transport coal from Yanzhou County. It is to be built with the aid of loans from Japan. The railway line begins at Yanzhou County, passes through Qufu, Sishui, Pingyi, Fei Xian, Linyi, Junan and Rizhao counties and stops at Shijiusuo Port. The total length is some 300 miles. [SK061228 Jinan Shandong Porvincial Service in Mandarin 2300 GMT 5 Nov 80]

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**GENERAL**

**'RADIO SHANGHAI' REPORTS ON ACTIVITIES OF UNLICENSED VENDORS**

OW081121 Shanghai City Service in Mandarin 1130 GMT 7 Nov 80

[Text] According to a station report, deputies of the Shanghai Municipal People's Congress yesterday inspected some streets in the vicinity of the northern railway station in Shanghai, as there was an increasing number of unlicensed vendors in the area who had seriously obstructed traffic and affected social order. They believed that it was necessary to adopt comprehensive measures to bring the chaotic situation in the northern railway station area under control. They suggested opening a comprehensive market.

According to statistics compiled by a department concerned, there were more than 140 unlicensed vendors in the vicinity of the northern railway station in mid-September. The number of unlicensed vendors rose to more than 600 in mid-October. Most of them were selling goods along the major thoroughfares in the area. Pedestrians were forced to walk in the street, affecting the normal operation of public vehicles and hampering traffic.

Among the unlicensed vendors, there are many people engaged in illegal activities, some of them buying and selling smuggled goods or ration coupons, while others sell bogus medicines. Still others waylay and hoodwink travellers under the pretext of introducing them to hotels. There are also a number of hooligans and pickpockets lurking among the vendors and waiting for a chance for mischief. This has affected social order.

The deputies of the municipal people's congress believed the northern railway station area was crowded and chaotic with sharp contradictions. This problem needed immediate solution. They called on the administrative bureau of industry and commerce, the public security bureau and other departments concerned to coordinate with each other and strengthen their control. The deputies also suggested building a comprehensive market in the northern railway station area where vendors would congregate to sell goods; and called for efforts to strike at various illegal and criminal activities.

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## GENERAL

### BRIEFS

**HUBEI PLANT INVESTIGATION**--The Chinese and American joint investigation group obtained good results from carrying out an investigation of plants in Hubei from 24 August to 15 October. The investigation group consisted of 8 Chinese and 5 American botanists. After they returned from their trip, they gave reports to young botanists and they were prepared to publish a book on the trip and their discoveries next year. [Wuhan Hubei Provincial Service in Mandarin 1100 GMT 22 Oct 80]

**HENAN ECONOMIC FORUM**--According to a HENAN RIBAO report, the Henan Provincial Governor Liu Jie conducted and presided over a forum on 22 October to study economic reform. The forum held that: there are a lot of new problems arising from the recent economic reforms. We must organize the strength of all departments to carry out investigations into the new situation in order to solve the problems. We must find solutions as to how to set up a rational price system and how to bring the province's economic superiority into play through economic reforms. The forum also discussed how to speed up the pace of economic research and set up and perfect research organs. [HK120915 Zhengzhou Henan Provincial Service in Mandarin 1130 GMT 24 Oct 80]

**HEILONGJIANG JOBLESS YOUTHS**--Since 1980, Heilongjiang Province has encouraged the establishment of collectively owned enterprises, joint ventures and individual business households to place jobless youths. Through these channels, more than 244,000 youths in the province found jobs in the January-August period, of which 90,000 found temporary jobs and 153,000 found permanent jobs. Statistics show that by the end of July more than 20,000 individual business households run by jobless youths were set up. [SK070640 Harbin Heilongjiang Provincial Service in Mandarin 1100 GMT 6 Nov 80]

**HEILONGJIANG SUPPLY ASSOCIATION**--The Heilongjiang Provincial Supply and Economic Association was officially established 9 November. Li Jianbai, secretary of the provincial party committee and president of the Provincial Academy of Social Sciences, and Hou Jie, deputy governor of the province, attended the inaugural ceremony and delivered speeches. Hou Jie, deputy governor, was elected honorary chairman of the first board of directors of the association. (Kong Ju), chief of the Provincial Supply Bureau, was elected chairman of the first board of directors. [SK112240 Harbin Heilongjiang Provincial Service in Mandarin 1100 GMT 9 Nov 80]

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## PUBLICATIONS

### BRIEFS

TAIWAN ENTERPRISE MANAGEMENT--Beijing, 10 Nov (XINHUA)--The book "Taiwan Qiyejia Tan Jingying Guanli" [Taiwan's Entrepreneurs Talk About Operation and Management] was recently published by the Xinhua Publishing House. The 150,000-character book contains 22 articles by Taiwan's entrepreneurs, scholars in enterprise management, journalists and government officials in economic affairs published in Taiwan's papers during the second half of 1979. The book introduces the operation and management of Taiwan's enterprises from six aspects--relationship between world economy and the operation and management of Taiwan's enterprises, general principles in enterprise management, personnel training, production and sales, financial management and guidance for small and medium-sized enterprises. It deals with the theories, work experience, specific measures, policies and suggestions in enterprise management and will help readers understand Taiwan's economic situation and the modern concepts in enterprise management. [OW121405 Beijing XINHUA Domestic Service in Chinese 0806 GMT 10 Nov 80]

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